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I. *Vocabulary of the Dialect spoken by the* Kotas *on the* Nilagiri *Hills by the Rev.* F. Metz.

I am not aware that any thing has been written about the language of the Kotas who occupy the seven villages on the Hills, called Kotagherry, and must have settled on these mountains at the same period or not long after the time, when the Todas, the so called Aborigines of the Hills, chose them as a pasture for their large herds of Buffalos. It is very probable that the Kotas lived among the Todas or in the neighbourhood of them before their immigration to the Hills, and that they supplied the latter with grain and jewels, in return for which they got all the Buffalos which died, at the time when both tribes inhabited some mountains to the North East of the Hills, and that the Kotas followed their acknowledged masters the Todas, on account of the rich harvest of Buffalo carcases by which they were sure to find always a good subsistence.

The dialects of the Todas and Kotas are so near to each other that both parties can converse with each other in their own language, but when the Badagas came up, they found it necessary to acquire the language of the new settlers, because they were superior both in numbers and civilization.

What I said formerly of the Toda language, that their singular pronounciation cannot be learned except by living amongst the people, is also true of the Kota dialect. The language of the former with its pectoral low notes, may very often appear to the unaccustomed ear of an European, as if a number of words were only imitations of the lowing of their Buffalos, and the dialect of the latter with its dental pronounciation appears in many instances as if the barking of their numerous half wild dogs had had an influence in forming it. I find it not difficult to speak about religion in the deep, often solemn tone of the Todas, but it seems to me like mockery to imitate the Kota pronounciation of the same words. Though none of the Hill tribes are very exact in cleanliness, still the name of Kota is used as a name of abuse, in the sense of filthy, by the Badagas and Todas notwithstanding the great dependence the latter acknowledge towards them; they are their scavengers, their musicians, their gold and blacksmiths, their potters, their basket makers, &c. Industry in these several branches makes them thriving and independent, and they can force their masters to many things, which they are very unwilling to perform, by refusing to make ploughs and pots &c. for them. If christianity should take root in the other tribes, so that they would no more condescend to pay honour to the Idols made by the Kotas, it will be a great trial for them. At different occasions the Kotas, who never were very favourably inclined towards our preaching, showed their power very plainly and forced some head men of the other tribes, who were friendly towards the missionaries, to compromise with their own better persuasion. The Kotas honour Siva as the supreme god whom they call Kamataraya and in each of their seven villages there is a temple for him as well as for his wife Parvati. There is a tradition that they emigrated from some mountains situated in the present Mysore, which their ancestors knew by the name of Kollimale, on which account the first village they built on the Hills, goes by the same name. In comparing the Toda vocabulary with the Kota words given

below, philologists will not find it difficult to discover the same root in most of their words, but if they had an opportunity to listen to their village quarrels, they would be surprized to find the same words so very differently pronounced by a Kota, from what they are by the mouth of a Toda, in his lonely Mandu. I have endeavoured to select the most common words corresponding to the same words of the Todas which formerly appeared in this journal.

VOCABULARY.

Abaisance (I make)	ಅಡ್ಡಬುಡ್ಡಪೆ* *aḍḍabuḍḍape.*
Abandon	ವಿಟ್ಟಿರ್ತವೆ *viṭṭirtave.*
Abide	ಇತವೆ *itave.*
Abominate	ತಲಿಕಪೆ* *ṭalikape*, or ಜೆಗ್ಗೆಪೆ *jeggepe.*
Abomination	ನಾಚಿಕೆ *náchike.*
Absorb	ನುಂಗಿಟಿಕಪೆ* *nungiṭikape.*
Absurd	ಪೋಕುರಿ *pókuri.*
Abundant	ಅಪರ *apara.*
Accept	ಎತ್ತಿಕಪೆ *ettikape.*
Accommodate	ಪೆರೆ ಈಸುಪೆ *pere ísupe.*
Account v.	ಲೆಕ್ಕಈಸುಪೆ *lekkaísupe.*
Account n.	ಲೆಕ್ಕನ *lekkana.*
Accompany (him)	ಅವನೋಡ ಹೋಗಪೆ *avanóḍa hógape.*

* I was not quite sure whether I should not substitute ಬಿ instead of ಪೆ because the Kota pronounciation is so very indistinct and in many verbs different people pronounce it something like ವೆ.

Accurate	ಸೆರೆ *sere.*
Accurse	ಶಾಪೆಯಿಟ್ಟುಕಪೆ *sápe iṭṭukape.*
Accuse	ಪಿರ್ಯಾದಿ ಪಡುದಕಪೆ *piryádi paḍudakape.*
Aches, (it)	ಏರ್ಸೊ *érso.*
Acquire	ಕಲ್ಲಕಪೆ *kallakape.*
Adore	ಕೊಂಬಿಟ್ಟುಕಪೆ *kombiṭṭukape.*
Advice	ಬುದ್ದಿ *buddi.*
Afar	ದೂರ *dúra.*
Affection	ಗವ *gava.*
Afraid (I am)	ಅಂಜಿಪೆ *anjipe.*
Afternoon	ಯೇರುಬುಡುವ ಜಾಮ *yérubuḍuva jáma,*

(time to loose the oxen from the plough)

Again	ಕಾಕೋನೆ *kákóne.*
Age	ಪೆರಯೆ *peraye.*
Ago	ಪೋನಾಱೆ *pónáṟe.*
Agree	ವೊಬ್ಬೊಪೆ *vobbope.*

Air ಕಾತೆ *káte,* others pronounce it ಕಾಟೆ *káṭe,* which I think is more correct.

Alas	ಅವವಾ *avavá.*
Alms	ದರ್ಮೆ *darme.*
Alike	ಸಂಮಾಯಿಪೆ *sammáyipe.*
All	ಯೆಲ್ಲಮೆ *yellame.*
Anecdote	ಪಾಟೆ *páṭe.*

Alone వొజ్జాళె *vojjáḷe.*

Amputate ఏరికపె *érikape.*

Anger కోపె *kópe,* కోపమె *kópame.*

Angry (I am) యెనగ కోపెబద్దదె *yenaga kópe baddade,* (to me anger has come.)

Anna పణ్ణమె *paṇṇame.*

Ancestor పేరైయనె *péraiyane.*

Another పిన్నొద్ద *pinnodda.*

Ant యిర్బె *yirbe,* White ant గెసళె *gesale.*

B.

Baby మగ్గె *magge.*

Back (n) పిత్తళె *pittale.*

Backbiting పిత్తళాట *pittaláṭa.*

Backward పిబ్బారె *pibbáre.*

Badge గుర్తె *gurte.*

Bag జీరుమె *jírume.*

Bail (I am) పెణాగపె *peṇágape.*

Bald తర్మండె *tarmande.*

Bamboo వెదెరె *vedere.*

Bat కనెపత్తె *kanepatte.*

Bathe నీరకార్తుకపె *nírakártukape.*

Battle పోరాస *pórása,* పోరాట *póráṭa.*

Bark of a tree పూళె *púḷe.*

Bark (verb)	ಪಾರ್ಕಪೆ *párkape.*
Barley	ಗಾಜ್ಜೆ *gájjc.*
Barren	ವೈದೆ *vaide.*
Basket	ಗಿಕ್ಕೆ *gikke.*
Beat	ಪುಯಿಕಪೆ *puyikape.*
Be	ವೊಳೆ *voḷe.*
Bean	ಅವುರೆ *avure.*
Bear (noun)	ಕರಡೆ *karaḍe.*
Bear (verb)	ಪೊರೇಕಪೆ *porékape.*
Beard	ಪೀಡೆ *píde,* ಮೀರ *míra.*
Beast	ಮಿರಿಗ *miriga.*
Bee	ತೇನಗುನಿ *ténaguni.*
Bee's wax	ಮೆಕ್ಕೆ *mekke.*
Bedstead	ಕಟ್ಟಿಲೆ *kaṭṭile.*
Before	ಮುಂದಾಲ್ *mundál.*
Beg	ವೇಸುಪೆ *vésupe.*
Beggar	ಪರ್ಕನೆ *parkane.*
Behead	ಕ್ವಾಟಲೆ *kwatale,* ಕುಯಿಕಪೆ *kuyikape.*
Behind	ಪಿಬ್ಬಾಲೆ *pibbále.*
Believe	ನೆಂಬಡೊಳೆ *nembadoḷc.*
Below	ಕ್ಯೀಯೆ *kyíye.*
Bellow	ಪಿಟ್ಟಿಗೆ *piṭṭige.*
Between	ನರ್ತಲೆ *nartale.*

Be it so	ಆಗೋತೆ *ágóte.*
Bell	ಮಂಣೆ *manne.*
Bend	ವಕ್ಕಿಸಿಪೆ *vakkisipe.*
Beware of	ವೊಳ್ಳಮೆನೋಸೆಉಳೋ *vollame nóse uló.*
Big	ದೊಡ್ಡುದೆ *doddude.*
Bile	ಪಿತ್ತೆ *pitte.*
Bind	ಕಟ್ಟುಕಪೆ *kattukape.*
Bird	ಪೆತೆ *pete.*
Bird cage	ಪೆತೆಗೂಡೆ *petegúde.*
Bite	ಕಡಿಕಪೆ *kadikape.*
Bison	ದೊಡ್ಡೆಂಮೆ *doddemme.*
Bitter	ಕಜ್ಜೆ *kajje.*
Black	ಕರೆ *kare.*
Blackberry	ಮುಳ್ಳಪಂಣೆ *mullapanne.*
Blind	ಕುರುಡನೆ *kurudane.*
Bliss	ಸುಕ್ಕಮೆ *sukkame.*
Blood	ನೆತ್ತುರು *netturu.*
Board	ಪಲಗೆ *palage.*
Bog, swamp	ಏಕೆ *éke.*
Boat	ಅರಿಗಿಲೆ *arigile.*
Born	ಪೆರ್ಕಪೆ *perkape.*
Boil (n)	ಪುಂಣೆ *punne.*
Boils it	ಪೊಯಿಕೊ *poyiko.*

Bone	ಎಲ್ಲವೆ *ellave.*
Bottle	ಪೆಟ್ಟಿಗೆ *peṭṭige.*
Boundary	ಕಟ್ಟೆ *katte.*
Bow (a)	ಬಿಲ್ಲೆ *bille.*
Bowels	ಕೊಡನೆ *koḍane.*
Box	ಪೆಟ್ಟಿಗೆ *peṭṭige.*
Boy	ಮಗ್ಗೆ *magge,* ಮಾಟಿ *máti.*
Breast	ಯೆದ್ದೆ *yedde,* woman's breast ಮೆಳ್ಳೆ *meḷḷe.*
Bracelet	ವಲ್ಲೆ *valle.*
Bramble	ತಪ್ಪೆ *tappe.*
Branch of a tree	ಜಿಲೆ *jile.*
Brass	ಕಜ್ಜೆ *kajje.*
Break	ಮುರ್ಸಿಕಪೆ *mursikape.*
Breath	ಜೀವಿಲು *jívilu.*
Breathlessness	ಉಪ್ಪಸೆ *uppase.*
Breed	ಪೆರ್ಕಿಸಿಪೆ *perkisipe.*
Bribe	ನಂಜುಮೆ *nanjume.*
Bring	ತಕಪೆ *takape.*
Brook	ಪೇಯೆ *péye.*
Brother (elder)	ಅಂಣೆ *aṇṇe,* (younger) ಕೆರಾಳೆ *keráḷe.*
Brother-in-law	ಪೆರುದಪ್ಪನೆ *perudappane.*
Brow	ಕಂಬುವೆ *kambuve.*
Buffalo	ಯಿಂಮೆ *yimme.*

Build	ಕಟ್ಟುಕಪೆ *kaṭṭukape,* ಯೆತ್ತುಕಪೆ *yettukape.*
Burden	ಪೊರ್ರೆ *porre.*
Burn	ಜುಟ್ಟುಕಪೆ *juṭṭukape.*
Business	ಕೇಕೆ *kéke.*
Butter	ವೆಂಣೆ *veṇṇe.*
Buttermilk	ಮಂಜೆ *manje.*
Butterfly	ಕಪ್ಪುಟೆ *kappuṭe.*

C.

Cage	ಗೂಡೆ *gúḍe.*
Calf	ಕಡೆ *kade.*
Call	ಆರ್ಕಪೆ *árkape.*
Calumniator	ಜಾಡಿಕಾರನೆ *jáḍikárane.*
Camel	ವೊಟ್ಟೆ *voṭṭe.*
Carriage wheel	ತಿರ್ಗನೆ *tirgane.*
Cast away	ತೈಲಿಕಪೆ *tailikape.*
Castle	ಕೋಟೆ *kóṭe.*
Cat	ಪೀಸೆ *píse.*
Catch	ಪತ್ತಕಪೆ* *pattakape.*
Centre	ನರ್ತಲೆ *nartale.*
Chaff	ಪೊಟ್ಟೆ *poṭṭe.*
Chain	ತಕ್ಕಾಲೆ *takkále.*

* It is very likely that the name of Ootacamund (Toda ಪತಕಮಡ್ಡು) "Patakhamaddu" is derived from this root and would literally mean, "Mand of catching," because it was a funeral Mand of the Todas.

Chalk	ಸುನಮೆ *suname.*
Chat	ಮಾನಿಕಪೆ *mánikape.*
Cheap	ಅಗ್ಗುಮೆ *aggume.*
Cheat	ಮೋಸ ಮಾಡ್ಕ ಪೆ *mósamáḍkape.*
Cheek	ತಾಡೆ *táḍe.*
Child	ಮಗ್ಗೆ *magge.*
Chin	ಪೀಡೆ *píde.*
Claw	ಕೊಲಕೆ *kolake.*
Clay	ಮಂಣೆ *maṇṇe.*
Clean	ಪಾಸನೆ *pásane.*
Cloud	ಕೀಡೆ *kíḍe,* ಗೀಡೆ *gíḍe.*
Climb	ಪೊರ್ತಪೆ *portape.*
Club	ಕುಂಡೆ *kuṇḍe.*
Coal	ಕರಿ *kari.*
Cobweb	ಜೆಲದಿಗೂಡೆ *jeladigúḍe.*
Cocoanut	ತೆಂಗಿನಕಾಯಿ *tenginakáyi.*
Cold (feverish)	ನಾನ್ಮರಲೆ *nánmarale.*
Cold from cold weather	ಕರ್ರವೆ *karrave.*
Colour	ಸಾಯವೆ *sáyave.*
Come	ವಾಕ್ಕೆನ *vákkena.*
Command	ಅಪ್ಪಣೆ *appaṇe.*
Conjurer	ಪಿಲಿಕಾರನೆ *pilikárane.*
Companion	ಮಾಳೆ *máḷe.*

Comprehend	ಅರ್ಥಿಪೆ	*arthipe.*
Consent	ಆಕಪೆ	*ákape.*
Corn, grain	ವತ್ತಮೆ	*vattame.*
Corner	ಮೂಲಮೆ	*múlame.*
Corpulent	ಬಹು ಪೆಟ್ಟಿಗೆ	*bahupeṭṭige.*
Cotton	ಪಂಡೆ	*paṇḍe.*
Cough	ಕಕ್ಕಿಲು	*kakkilu.*
Count	ಯೆಕ್ಕನ ಕೇಕೆನ	*yekkana kékena.*
Countenance	ಮೋಂಡೆ	*móṇḍe.*
Country	ನಾಡೆ	*náḍe.*
Courage	ದೈರ್ಯವೆ	*dairyave.*
Cowries	ಕೌವಡಿ	*kouvaḍi.*
Cover, hide	ಮುಜ್ಜಿಪೆ	*mujjipe.*
Cow	ಆವೆ	*áve.*
Crab	ನೈಲಿನೆ	*nailine.*
Cream	ಮಂಜೆ ವೆಣ್ಣೆ	*manje veṇṇe.*
Cripple	ಕುಟ್ಟನೆ	*kuṭṭane.*
Crooked	ಕೋಂಕೆ	*kónke.*
Crow	ಕಾಕೆ	*káke.*
Cry	ಐಕಪೆ	*aikape.*
Cultivate, plough	ಉಕಪೆ	*ukape.*
Curse	ಶಾಪೆ ಯಿಟ್ಟುಕಪೆ	*sápe yiṭṭukape.*
Cut	ಏರ್ಕಪೆ	*érkape.*

D.

Dance (verb)	ಆಡಕಪೆ *áḍakape.*
Dark	ಕತ್ತಲೆ *kattale.*
Daughter	ಪೆಂಮಗ್ಗೆ *pemmagge.*
Daughter in law	ಸೊಸೆ *sose.*
Day	ನಾಳೆ *náḷe.*
To day	ಯಿಂದೆ *yinde.*
Day after to morrow	ನಂಗೆಗೆ *nangege.*
Deaf	ಕಿವಿಡನೆ *kiviḍane.*
Death	ತಾವೆ *táve.*
Debt	ಸಾಲಮೆ *sálame.*
Deceive	ಮೋಸಮಾಡಕಪೆ *mósamáḍakape.*
Deceiver	ಮೋಸಕಾರನೆ *mósakárane.*
Deep	ಉದ್ದುಮೆ *uddume.*
Demon	ಬೂತುಮೆ *bútume.*
Deny	ಯಿಲ್ಲಾದುಪೆ *yilládupe.*
Depart	ಪೋಗಪೆ *pógape,* ಹೋಗಪೆ *hógape.*
Deride	ನಲ್ಲಿಸಿಕಪೆ *nallisikape.*
Desert	ವಿಟ್ಟಿರ್ಕವೆ *viṭṭirkave.*
Descend	ಎರ್ಕವೆ *erkave.*
Desire	ಆವೆಲು *ávelu.*
Diarrhœa	ಪೆಟ್ಟಿಗೆ ಹೋಯಿತೊ *peṭṭige hóyito.*
Difference	ಕಡಲುಮೆ *kaḍalume.*

Dig	ಅಗ್ಗಪೆ *aggape.*
Diminish	ಜೆಟ್ಟಿಗಮಾಡಕಪೆ *jeṭṭigamáḍakape.*
Die	ತೌಕವೆ *taukave* or ತಾಕವೆ *tákave.*
Dirt	ಮಾಸೆ *máse.*
Dirty (I make)	ಮಾಸೆ ಕೇಕಪೆ *másekékape.*
Dishonour	ಮಾನಕೆಟ್ಟಿಸಿರ್ಕಪೆ *mánakeṭṭisirkape.*
Disappear	ಕಡ್ಡಾಧೋಗಪೆ *kaḍḍádhógape.*
Dismiss	ಕೈತಿರ್ಕಪೆ *kaitirkape.*
Dispute	ಹೊಯಿಕಿರ್ಕಿಪೆ *hoyikirkipe.*
Ditch	ಗುಯ್ಯಿಯೆ *guyyiye.*
Divide	ಪಾಲ್ಕೇಕಪೆ *pálkékape.*
Dog	ನಾಯೆ *náye.*
Door	ತಾಯೆ *táye.*
Drive	ಯೇಥಿರ್ಕಪೆ *yéthirkape.*
Drink	ಉಣಕಪೆ *uṇakape.*
Drown	ಮೂಯಿಗಿಹೋಗಪೆ *múyigi hógape.*
Drop	ಸೊಟ್ಟೆ *soṭṭe.*
Drum	ಪರ್ರ *parra.*
Drum (verb)	ಪರ್ರಹುಯಿಕಪೆ *parrahuyikape.*
Dry	ವೊನ್ನಕಪೆ *vonnakape.*
Dull	ಪೊಟ್ಟನೆ *poṭṭane.*
Dung	ಕೋಪಾರುನೆ *kóparune,* ಪೀಯೆ *píye.*
Dwarf	ಮೊಣ್ಣಿನ *moṇṇina.*

E.

Eagle, vulture	ನಾಯೆಪೊಧಕಾರನ *náyepodhakárana.*
Ear	ಕೇವಿ *kévi.*
Earth, ground	ಬುಯಿಮಿ *buyimi.*
Echo	ವೋಜೆ *vóje.*
Eat	ತಿನಿಕಪೆ *tinikape.*
Eclipse	ಗಿರಣ *giraṇa.*
Egg	ಮೊಟ್ಟೆ *moṭṭe.*
Elegant	ಪಾಸನೆ *pásane.*
Eight	ಯೆಟ್ಟೆ *yeṭṭe.*
Eighteen	ಪವೆನೆಟ್ಟೆ *paveneṭṭe.*
Eighty	ಯೆಂಬತ್ತು *yembattu.*
Enemy	ಹಗ್ಗೆಗಾರನೆ *haggegárane.*
Enough	ಸಾಕೊ *sáko.*
Elbow	ಮೊಗ್ಗೈಯೆ *moggaiye.*
Elephant	ಆನೆ *áne.*
Elk	ಮಾವೆ *máve.*
Embrace	ತ್ಯಬ್ಬಿಸಿಪೆ *tyabbisipe.*
Empire	ಸೀಮೆ *síme.*
Equal	ಸೆರೆ *sere.*
Ever	ಯೆಂದುಗು *yendugu.*
Excrement	ಪೀಯೆ *píye.*
Expel	ಕೈತಿರ್ಕಪೆ *kaitirkape.*

Expenditure	ಸಂತೆಕು *santeku.*
Eye	ಕಂಣೆ *kaṇṇe.*
Enchanter	ಉಡಿಕಾರನೆ *uḍikárane.*
End (verb)	ಕೆಸೆತ್ಹೋಕಪೆ *kesethókape.*
Enter	ವೊಳ್ಪೋಗಪೆ *voḷpógape.*
Envy	ಹೊಟ್ಟೆಕಿಚ್ಚೆ *hoṭṭekichche.*
Error	ತಪ್ಪೆ *tappe.*
Evening	ಕತ್ತಲೆ *kattale.*
Every	ಯೆಲ್ಲಾಮೆ *yelláme.*

F.

Fall	ವಿಡುಡುಹೋಗಪೆ *viduduhógape.*
Face	ಮೋಂಡೆ *mónḍe.*
Falsehood	ಕಿಂಡೆ *kinde.*
Family	ಕುಟುಂಬೆ *kuṭumbe.*
Faith	ನಂಬಿಕೆ *nambike.*
Fat	ವಾಳುನೆ *válune.*
Far	ದೂರ *dúra,* ದೂರುಮೆ *dúrume.*
Farmer	ವೊಕ್ಕಲಿಗನೆ *vokkaligane.*
Funeral	ತಾವೆ *táve.*
Fur	ತೋಳೆ *tóḷe.*
Fort	ಊಸೆ *úse.*

G.

Gain	ಲಾಬೆ *lábe.*

Gall	ಪಿತ್ತೆ *pitte.*
Gallows	ತೂಕಮರವೆ *túkamarave.*
Garlic	ಉಳಿ *uḷi.*
Gather	ಕೂಟಕಪೆ *kúṭakape.*
Gate	ಬಾಲೆ *bále.*
Ghee	ನೈಯೆ *naiye.*
Ghost	ಬೂತೆ *búte.*
Giant	ಅರ್ಕಾಸೆ *arkáse.*
Girl	ಪೆಂಮಗ್ಗೆ *pemmagge.*
Give	ಕೊಡುಕಪೆ *koḍukape,* ತಕಪೆ *takape.*
Go	ಹೋಗಪೆ *hógape.*
Gloworm	ಮೀನೆ *míne.*
Goat	ಆಡೆ *áḍe.*
God	ದೇವರೆ *dévare.*
Gold	ಪೊಂಣೆ *poṇṇe*
Goldsmith	ವೆಲಿಗೆಸನ *veligesana.*
Good	ವೊಳ್ಳೆದೆ *voḷḷede.*
Gooseberry	ತೌಟೆಪಂಣೆ *tauṭepaṇṇe.*
Grain	ವತ್ತಮೆ *vattame.*
Grandfather	ಪೆರಾಳೆ *peráḷe.*
Grandmother	ಪೆರವ್ವೆ *peravve.*
Grandson	ಮಂಮಗ್ಗೆ *mammagge.*
Grass	ಪುಲ್ಲೆ *pulle.*

Grasshopper	ಮಿಟಿಲೆ *miṭile.*
Gray	ನರೆ *nare.*
Great	ದೊಡ್ಡೆ *doḍḍe.*
Green	ಪಚೆ *pache.*
Grief	ದುಕ್ಕ *dukka.*
Grind	ಬೀಸುಡ್ಡವಕೆನ *bísuḍḍavakena.*
Grinding stone	ಕಲ್ಲೋಲೆ *kallóle.*
Groan	ನರಗಿಯುಡ್ಡೊಳೆ *naragiyuḍḍoḷe.*
Ground	ನೆಲ್ಲುಮೆ *nellume.*

H.

Hail	ಅರಗಲ್ಲಮ್ಯಾಯೆ *aragallamyáye.*
Hair	ಮೀರೆ *míre.*
Half	ಅಡುಮೆ *aḍume.*
Hand	ಕೈಯೆ *kaiye.*
Hard	ಕಲ್ಲಕಜೆಕೊ *kallakajeko.*
Hair	ಮೊಳಮೆ *moḷame.*
Harlot	ಸೂಳೆಮಗ್ಗೆ *súḷemagge.*
Hate	ಪಗ್ಗೆವಜಯಿಟ್ಟುಕಪೆ *paggevajayiṭṭukape.*
Hatred	ಪಗ್ಗೆ *pagge.*
Halt	ಕುಟ್ಹಾರುಡ್ಡವಕಪೆ *kuṭháruḍḍavakape.*
Hammer	ತಪುಟಿಗೆ *taputige.*
Handle	ಕಾವೆ *káve.*
Hang (oneself)	ನೇಂದತೌಕಪೆ *néndataukape.*

Hang (another) ತೂಕಪೆ *túkape.*

Hatchet ಯಿರ್ವಾಲೆ *yirvále.*

Haughty ಮೇಟೆ *méṭe.*

Hawknose ಪಥುಮೂಕೆ *pathumúke.*

Head ಮಂಡೆ *mande.*

Hearken ಕೇಳಕಪೆ *kéḷakape.*

Heart ಗೆಂಡೆ *genḍe.*

Heat ವೀಳೆ *víḷe.*

He ಅವನೆ *avane.*

Heap ಗೂಜಲೆ *gújale.*

Heavy ವಾರಮೆ *várame.*

Here ಯಿಯಯಿ *yiyayi* (ಯಿಲ್ಲೆ) *yille.*

Hew ಏರ್ಕಪೆ *érkape.*

Herb ಸೊಪ್ಪೆ *soppe.*

Hiccup ಹಿಕ್ಕೊಟೆ *hikkoṭe.*

Hide (reflex) ವೊಳಸಕವೆ *voḷasakave.*

Hide ಪೂರ್ಕಪೆ *púrkape.*

Hill ದಿಟ್ಟೆ *diṭṭe.*

Hog ಪಜ್ಜೆ *pajje.*

Hoof ಕೊಲಕೆ *kolake.*

Hook ಕೊಂಕೆ *konke.*

Hold ಪದ್ಧಕಪೆ *paddhakape.*

Honey ತೇನೆ *téne.*

Honour	ಮಾನೆ *máne.*
Horn	ಕೊಂಬೆ *kombe.*
Horse	ಕುದುರೆ *kudure.*
Horsegram	ಪುರುಳಿ *puruli.*
Hot	ವೇದ್ದ *védda.*
House	ಪೈಯೆ *paiye.*
How	ಯೇನೇನಮೆ *yénéname.*
Howl	ಪಾರ್ಕಪೆ *párkape.*
Hungry	ಪೆಟ್ಟಿಹೋಸೆ *peṭṭihóse.*
Hundred	ನೂರೆ *núre.*
Hunt	ವೇಟಹೋಗಪೆ *véṭahógape.*
Husband	ಆಳೆ *áḷe.*
Humbug	ಪಿತ್ತಲಾಟೆ *pittaláṭe.*

I.

I	ಆನೆ *áne.*
Ibex	ಕಲ್ಲಾಡೆ *kalláḍe.*
Ice	ಪೈನು *painu.*
Idle	ಮೋಡ *móḍa,* ಸೋಮಾರೆ *sómáre.*
Ichneumon	ಕೀರಿ *kíri.*
If	ಮೇಲೆ *méle.*
Illness	ನೋವೆ *nóve.*
Impede	ಅಡಿಗಿಕಪೆ *aḍigikape.*
Impotent	ವರದನೆ *varadane.*

Improper	ಸೆರೆಯಿಲ್ಲ *sereyilla.*
Improve	ವೊಳ್ಳ ಮೊಳೆ *voḷḷamoḷe.*
Impure	ಮಾಸೆಕೊ *máseko.*
Incense	ಧೂಪೆ *dúpe,*
Increase	ದೊಡ್ಡ ಲಾಕಪೆ *doḍḍalákape.*
Indecent	ಮಾನಕೆಟ್ಟವನ *mánakeṭṭavana.*
Inflammation	ಜೆಗ್ಗೆ *jegge.*
Infant, female	ಪೆಂಮಗ್ಗೆ *pemmagge.*
Infant, male	ಗಂಡೆಮಗ್ಗೆ *ganḍemagge.*
Informer	ಮೊರೆಕಾರನೆ *morekárane.*
Insufficient	ಯೆಡ *yeḍa.*
Ink	ಕರಿ *kari.*
Insensible	ನೆನವಿಲ್ಲ *nenavilla.*
Insane	ಬೂತವಜಿಕೊ *bútavajiko.*
Interest	ವಜ್ಜೆ *vajje.*
Ire	ಕೋಪಮೆ *kópame.*
Iron	ಯಿಬ್ಬೆ *yibbe.*
Itch	ತೂರಿವೆ *túrive.*
Iris (of the eye)	ಕಂಣೆಮಗ್ಗೆ *kaṇṇemagge.*

J.

Jackal	ನರಿ *nari.*
Jackfruit	ಪಳ ಪಂಣೆಮೆ *paḷapaṇṇeme.*
Jest	ನಲ್ಲಿಕಪೆ *nallikape.*

Join	ಕೂಟಕಪೆ *kúṭakape.*
Journey	ಪಯಣ *payaṇa.*
Joy	ಸಂತೋಸ *santósa.*
Jug	ಕೊಡಮೆ *koḍame.*
Juice	ನೀರೆ *níre.*
Jump	ಪಾರ್ಕಪೆ *párkape.*
Justice	ನಾಯಮೆ *náyame.*

K.

Keep	ಕಾಪಾಡಕಪೆ *kápáḍakape.*
Key	ಬೀಗದಕೈ *bígadakai.*
Kick	ವೊಕ್ಕಪೆ *vokkape.*
Kill	ತೌವೆರ್ಷಯಿಕಪೆ *tauvershayikape.*
Kind (noun)	ಮಾದರೆ *mádare.*
Kindness	ದಯೆ *daye.*
Kindred	ನೆಟ್ಟನೆ *neṭṭane.*
King	ದೊರೆ *dore.*
Kiss	ಮೂಂಗೆಹಾಕಿಪೆ *múngehákipe.*
Knee	ಮೊಗ್ಗಾಲೆ *moggále.*
Kneel	ಮೊಗ್ಗಾಲೂರ್ಕವೆ *moggálúrkave.*
Knock	ಕೊಡ್ಗಲ್ ಕೋಟುಕಪೆ *koḍgul koṭukape.*
Know	ಅರ್ಸಿಪೆ *arsipe.*
Knife	ಜೂರಿ *júri.*

L.

Ladder	ಯೇಣಿಲು *yénilu.*
Lake	ಕೇರೆ *kére.*
Language	ಬಾಸೆ *báse.*
Late	ತಡೆವಾಯಿ *taḍeváyi.*
Lead	ತೀಸಲು *tísalu.*
Leap	ಪಾರ್ಕಪೆ *párkape.*
Leaf	ಯೆಲೆ *yele.*
Leather	ತೋಳೆ *tóḷe.*
Leave	ಬಿಟ್ಟುಡ್ಡಹೋಗಪೆ *biṭṭuḍḍahógape.*
Leech	ಯಿಪುವೆ *yipuve.*
Left	ಯೆಡ್ಡೆ *yeḍḍe.*
Leg	ಕಾಲೆ *kále.*
Lemon	ಎಲ್ಮಿಚ್ಚೆ *yelmichche.*
Leopard	ಕಿರ್ಬನೆ *kirbane.*
Leprosy	ದೊಡ್ಡರೋಗ *doḍḍaróga.*
Liar	ಸುಳ್ಳುಗಾರನೆ *suḷḷugárane.*
Lie down	ವೊರ್ಕಪೆ *vorkape.*
Life	ಜೀವೆ *jíve.*
Lift up	ತೂಕಪೆ *túkape.*
Lime	ಸುನುಮೆ *sunume.*
Limit	ಕಟ್ಟೆ *katte.*
Lip	ತೂಸ *túsa.*

Listen — ವೋರಾಟಿಕೆನ *vóráṭikena.*

Little — ಕುಂನ *kunna.*

Lizard — ವೋಣ *vóṇa.*

Load — ಪೆರ್ರೆ *perre.*

Lock — ಬೀಗೆ *bíge.*

Long — ಉದ್ದುಮೆ *uddume.*

Look — ನೋಡಕಪೆ *nóḍakape.*

Loosen — ಬಿಡುಕಪೆ *biḍukape.*

Loud — ವೊಳ್ಳಾಂ *voḷḷám.*

Love (I) — ಗವವಜುಪೆ *gavavajupe.*

Lust — ಆವೆಲು *ávelu.*

Labour, (I) — ಗೀತವೆ *gítave.*

M.

Mad — ಬೂತಪೆಜವನ *bútapejavana.*

Make — ಕೇಕಪೆ *kékape.*

Malediction — ಶಾಪೆ *sápe.*

Malice (I have) — ಹೊಟ್ಟೆಕಿಚ್ಚುಕೇಕಪೆ *hoṭṭekichchukékape.*

Man — ಮನಿಸನ *manisana,* ಆಳೆ *áḷe.*

Mango — ಮಾವ್ಹಂಣೆ *mávhaṇṇe.*

Many — ಅಪರಮೆ *aparame.*

Marry — ಪೇಟುಕೊಳಕಪೆ *péṭukoḷakape.*

Marsh, swamp — ಏಕೆ *éke.*

Mat — ಮಂದರಿ *mandari.*

Matter	ಗೀವೆ *gíve.*
Meat	ಬೋಟೆ *bóte.*
Medicine	ಮದ್ದೆ *madde.*
Meet	ಆಳಾರೆವದ್ದಕಾಡ್ಕಪೆ *áḷárevaddakádkape.*
Melt	ಕರ್ಗಸಕಪೆ *kargasakape.*
Milk	ಪಾಲೆ *pále.*
Milk (verb)	ಕರ್ರಕಪೆ *karrakape.*
Miscarry	ಮಗ್ಗೆವೀತಕೊ *maggevítako.*
Mist	ಮಂಜೆ *manje.*
Mind	ಮನಸೆ *manase.*
Mind (verb)	ಉನಿಸಪೆ *unisape.*
Miser	ಕರಿಗಾರನೆ *karigárane.*
Mock	ಕೊಂಸಕಪೆ *komsakape.*
Mocking	ಗೇಲಿ *géli*
Money	ಪಣಂ *paṇam.*
Moment	ಜೆನನ್ಹೊತ್ತಿಗೆ *jenanhottige.*
Monkey	ಕೋರ *kóra.*
Moon	ತಿಗ್ಗಲೆ *tiggale.*
Month	ಪೆರ್ರೆ *perre.*
Morning	ವೆಳತಲೆ *veḷatale.*
Morrow (to)	ನಾಳಕೆ *náḷake.*
Mother	ಅವ್ವೆ *avve.*
Motherless	ತವರಿ *tavari.*

Mourn మండెకూటిత్త్యైకపి *mandekúṭiai-kape.* (Literally I join the head to another and weep.)

Mouse ఏజె *éje.*

Mouth వాయె *váye.*

Muscle నెర్బె *nerbe.*

Mount, ascend పత్తకపె *pattakape.*

Mountain బెట్టుమె *beṭṭume.*

Must వేటు *vétu,* must not వేడె *véḍe.*

Mute పేమె *péme.*

N.

Nail ఊరె *úre.*

Naked వెరుయిపి *veruyipi.*

Name పేరె *pére.*

Narrative పాఠె *paṭhe.*

Nation కొల్లమె *koḷḷame.*

Naught యేనుమిల్ల *yénumilla.*

Navel బుక్కవె *bukkave.*

Near వొత్తలె *vottale.*

Neat పాపనె *pápane.*

Neck కర్తలె *kartale.*

Needle తూసె *túse.*

Neighbour గోడవ్వైయె *góḍavaiye.*

Nest గూడె *gúḍe*

Never	ಯೇನಾಳುಕಿಲ್ಲ *yénáḷukilla.*
New	ಪುಧು *pudhu.*
News	ಸುದ್ದೆ *sudde.*
Nick name	ಪೊರ್ರಪೇರ *porrapéra.*
Night	ಕತ್ತಲೆ *kattale.*
Nine	ವೊರಬಡೆ *vorabade.*
Nineteen	ಹಡೊಂಬತ್ತು *hadombattu.*
Ninety	ತೊಂಬತ್ತೆ *tombatte.*
Noise	ಸದ್ದುಮೆ *saddume.*
Noon	ಮದೈನೆ *madaine,*
North	ವಡಗೆ *vaḍage.*
Nose	ಮೂಕೆ *múke.*
Nostrils	ಮೂಕಸೂಂತೆ *múkasúnte.*
No	ಯಿಲ್ಲ *yilla.*
Nothing	ಯೇನಿಲ್ಲಮೆ *yénillame.*
Nourish	ಸಾಕಪೆ *sákape.*
Now	ಯೀನೆ *yíne.*

O.

Oath (I make)	ಸತ್ಯಕೇಕಪೆ *satyakékape.*
Ocean	ಸೌಂದುರು *saunduru.*
Oil	ಯೆಂಣೆ *yeṇṇe.*
Old	ಪೈರ *paira.*
Omen	ಸೌಮೆ *saume,* ಜೌಮೆ *jaume.*

One	ವೊದ್ದೆ *vodde.*
Onion	ಯೀರುಳಿ *yíruḷi.*
Open	ತೆರ್ರಕಪೆ *terrakape.*
Once	ವೊರುಟ್ಟೆ *voruṭṭe.*
Orient	ಮೂಡೆ *múḍe.*
Order to	ಯೇವಲುಯಿಟ್ಟಪೆ *yévalu yiṭṭape.*
Other	ಯಿಂನೊಂದೆ *yinnonde.*
Outside	ಪೊರ್ರಂಜೆ *porranje.*
Over	ಮೇಕೆ *méke.*
Owl	ಗುಂಮನೆ *gummane.*
Ox	ಯೆತ್ತೆ *yette.*

P.

Pain	ಉರ್ಸು *ursu.*
Palace	ಅರಮನೆ *aramane.*
Palate	ಕಿರ್ರನಲಗೆ *kirranalage.*
Paper	ಕಾಗಜೆ *kágaje.*
Paper	ನಿಂಗಲ್ ಪಂನಂ *ningalpamnam.*
Part	ಪಾಲುಮೆ *pálume.*
Passion	ಕೋಪಮೆ *kópame.*
Path	ಆಳಾರೆ *áḷare.*
Pawn	ಅಡವೈಯೆ *aḍavaiye.*
Peaceful	ಉಳಿಸ್ತನ *uḷistana.*
Peacock	ಮೀಳೆ *míḷe.*

Pearl	ಮುತ್ತೆ	*mutte.*
Pen	ಪೆಕೆ	*peke.*
Penis	ಬೀಡೆ	*bíḍe.*
Pepper	ಮೊಳಗು	*moḷagu.*
Perspiration	ಉರೆ	*ure.*
Perish	ಕೆಟ್ಟೋಗಪೆ	*keṭṭógape.*
Piece	ತುಂಡುಮೆ	*tunḍume.*
Pig	ಪಜ್ಜೆ	*pajje.*
Pilfer	ಕಳ್ಳಕಪೆ	*kaḷḷakape.*
Pinch (to)	ನಿಲ್ಲಕಪೆ	*nillakape.*
Pipe	ಬುಗುರಿ	*buguri.*
Piss	ಮೊಳಟ್ಟುಕಪೆ	*moḷaṭṭukape.*
Pit	ಕುಯ್ಯೆ	*kuyye.*
Place	ಯೆಡಮೆ	*yeḍame.*
Plantain	ಬಾಯ್ಯೆಹಂಣ್ಣೆ	*báyehaṇṇe.*
Play	ಆಟ	*áṭa.*
Play to	ಆಟಕಪೆ	*áṭakape.*
Plenty	ಅಪರಂ	*aparam.*
Pledge (I)	ಪೆಂಣಾಗಪೆ	*peṇṇágape.*
Plough	ನೇಲೆಗೆ	*nélege.*
Plough (verb)	ಉವಕ್ಕವೆ	*uvakkave.*
Pocket	ಕೋಂಡಿಲೆ	*kónḍile.*
Point out	ಕಾಕ್ ಕಪೆ	*katkape.*

Poison	ನಂಜು *nanju.*
Pond	ಕೇರೆ *kére.*
Poor	ವಡವನೆ *vaḍavane.*
Potter	ಕೊಂಬಾರನ್ *kombáren.*
Porcupine	ಪೀಪಜ್ಜೆ *pípajje.*
Pour	ಅಟ್ಟುಕಪೆ *aṭṭukape.*
Portion	ಪಾಲಮೆ *pálame.*
Post to	ನಿಲ್ಲಕಿಸಿಕಪೆ *nillakisikape.*
Prepare	ವೊದ್ದಗುರ್ಕಪೆ *voddagurkape.*
Pride	ಮೇಟೆ *méṭe.*
Pray	ಪರ್ಧಕಪೆ *pardhakape.*
Property	ಆದಾರ *ádára.*
Prostrate	ಅಡಮಿಟ್ಕೆನ್ *aḍamitken.*
Proud	ಮೇಟೆಗಾರ *méṭegára.*
Prove	ರುಜಕೇಕಪೆ *rujakékape.*
Pulse	ನಾಟೆ *náṭe.*
Purchase	ವೆಲೆಗಯೆತ್ತಕಪೆ *velegayettakape.*
Purge	ಪೆಟ್ಟೆಹೋಯಿತೊ *peṭṭehóyito.*
Purse	ಕೈಜೀರುಮೆ *kaijírume.*
Push	ವಾಬಕೇಕಪೆ *vabakékape.*
Putrid	ಕಿದ್ದೋಜೆ *kiddóje.*

Q.

Quake	ನಡಿಗೇಪೆ *naḍigépe.*

Quick — ತೈದ *taida*, ತರ್ರವರ *tarravara.*

Quench, spoil — ಕೆಟ್ಟಿಸ್ಕಪೆ *keṭṭiskape.*

Quite — ಯೆಲ್ಲಮೆ *yellame.*

R.

Rage (verb) — ಕೋಪಮ್ಮಾಡಕಪೆ *kópammáḍakape.*

Rain — ಮ್ಯಾಯೆ *myáye.*

Rain (verb) — ಮ್ಯಾಯೆಹುಸೊ *myayehuso.*

Rainbow — ಕೊರಂಗೂಳೆ *korangúḷe.*

Raise — ಯೆತ್ತಕಪೆ *yettakape.*

Raspberry — ಮುಳ್ಳುಪಿಲ್ಲೆ *muḷḷupille.*

Recite — ಯಿಂನೊಂದಪೇಟುಪಾರ್ತಕಪೆ *yinnondapéṭupártakape.*

Recollection — ನೆಪ್ಪು *neppu.*

Run — ವೋಡಕಪೆ *vóḍakape.*

Rat — ಏಜೆ *éje.*

Razor — ತಲವಾಲ *talavála.*

Reconcile — ವೊಂದಕ್ಕೀತೆನ *vondakkítena.*

Red — ಕೆಪ್ಪೆ *keppe.*

Refuse — ವೇಡನ್ನುಕಪೆ *véḍannukape.*

Regulate — ಸೆರಿಗೀಕೆನ *serigíkena.*

Release — ವಿಟ್ಟಿಸ್ಕೆನ *viṭṭiskena.*

Require — ವೇಕೆಂದಹರ್ತಿಕೆನ *vékendahartikena.*

Rend, tear — ಕೀರ್ಕಪೆ *kírkape.*

Rhododendron	ವಿಲಿಮರಮೆ *vilimarame.*
Rheumatism	ಜನಿ *jani.*
Rib	ಕರ್ಸೀಬೆ *karsíbe.*
Riches	ದೊಡ್ಡವಡುಕೆ *doḍḍavaduke.*
Right	ಸೆರಿ *seri.*
Right hand	ವಲಕೈ *valakai.*
Ring	ಮೋಡಾರಂ *móḍáram.*
Rise	ಮೇಕೀಕಪೆ *mékíkape.*
River	ಪೇಯೆ *péye.*
Road	ಆಳಾರೆ *aḷáre,* ಆಯ್ಡಾರೆ *áidáre.*
Roar	ಆರ್ಕಪೆ *árkape.*
Rock	ಎರ್ರೆ *erre.*
Roof	ಪನಿಮೆಲೆ *panimele.*
Root	ವೇರೆ *vére.*
Rope of buffalo hide	ಮಿಲ್ಲಿ *milli.*
Rope of hemp	ನಾರೆ *náre.*
Rose	ಗಂಜೆಗುಳ್ಳೆಹೂವೆ *ganjeguḷḷehúve.*
Rotten	ಕಿಡ್ಡೆಕೊ *kiddeko.*
Rub	ಉದ್ದಸ್ಕಪೆ *uddaskape.*
Rubbish	ಪಬ್ಬೆ *pabbe.*
Ruminate, 3rd person	ಮೇಕಾಸಕೊ *mékásako.*
Run away	ವೋಷೋಗಪೆ vóshógape.
Rust	ಕಿಲುಂಬು *kilumbu.*

Rusty (it is)	ಕಿಲುಂಬುಪಜ್ಜಿಕೊ *kilumbupajjiko.*

S.

Sack	ಜೀರುಮೆ *jírume.*
Salep plant	ನೈಗಾಉಲ್ಸು *naigaulsu.*
Saliva	ಯೆಂಜೆಲೆ *yenjele.*
Salt	ಉಪ್ಪೆ *uppe.*
Salute	ಕೊಂಬುಟ್ಟುಕಪೆ *kombuṭṭukape.*
Sand	ಮಣಲೆ *maṇale.*
Saturday	ತೈನೆ *taine.*
Satisfied (not hungry)	ಪೆಟ್ಟೆತೀವೆಕೊ *peṭṭetíveko.*
Sauce	ಉದ್ದುಕೆ *udduke.*
Scatter	ವೀರಿಟ್ಟಕಪೆ *víriṭṭakape.*
Scratch	ಯೆತ್ತಕಪೆ *yettakape.*
Scent	ಗಮುಲೆ *gamule.*
Scent (impers)	ಗಮುಲೈಕೊ *gamulaiko.*
Scorpion	ಜೇಳೆ *jéḷe.*
Scull	ಮಂಡೋರೆ *mandóre.*
Seal	ಮುದರೆ *mudare.*
See	ನೋಟ್ಕಪೆ *nóṭkape.*
Sell	ಮಾರ್ಕಪೆ *márkape.*
Seize	ಪತ್ತಕಪೆ *pattakape.*
Send	ಕ್ಯೇಪ್ಕಪೆ *kyépkape.*
Set (the sun sets)	ಪೊತ್ತುಮಾರ್ಕಕೊ *pottumárkako.*

Seven	ಯೇಳೆ *yéḷe.*
Seventeen	ಪತ್ತಿನೇಳೆ *pattinéḷe.*
Seventy	ಯೇಳ್ವತ್ತೆ *yéḷvatte.*
Sew	ಕುತ್ತಕಪೆ *kuttakape.*
Shadow	ನೆರಲೆ *nerale.*
Shake	ಅಳುಕಪೆ *aḷukape.*
Shame	ನಾನಮೆ *náname.*
Shameless	ನಾನಮಿಲ್ಲ *nánamilla.*
Shave	ಮಾನಿಕಪೆ *mánikape.*
She	ಅವಳೆ *avaḷe.*
Shell	ಸಂಕೆ *sanke.*
Ship	ಕಬಾಲ್ *kabál.*
Short	ಮೊಡೆ *moḍe.*
Shoulder	ಮೂಡೆ *múḍe.*
Show	ಕಾಟ್ಕಪೆ *káṭkape,* ತೋರ್ಕಪೆ *tórkape.*
Shrub	ದಬ್ಬೆ *dabbe.*
Shut	ಅಡಪೆ *aḍape.*
Sick	ಹರುಸಮಿಲ್ಲ *harusamilla.*
Sickle	ಕಂಕತ್ತಿ *kankatti.*
Side	ವಕುರೆ *vakure.*
Sigh	ನರಿಕಪೆ *narikape.*
Sight	ನೋಟುಮೆ *nóṭume.*
Sign	ಗುರುತೆ *gurute.*

Silent (I am)	పక్కికపె *pakkikape.*
Silver	వెళి *veḷi.*
Sin	పాపుమె *pápume.*
Single	వొజ్జె ఆళె *vojje áḷe.*
Sister	అక్కనె *akkane,* కెర్దాసె *kerdáse.*
Six	ఆరు *áru.*
Sixteen	పదినారు *padináru.*
Sixty	ఆర్వత్తె *arvatte.*
Skin	తోళె *tóḷe.*
Sky	వానుమె *vánume.*
Slay	తౌవీకపె *tauvíkape.*
Sleep	వొర్రకపె *vorrakape.*
Slide, slip	జారవైపె *járavaipe.*
Slippery	జారిలు *járilu.*
Slope	వాగరె *vágare.*
Slow	పేమేం *pémém.*
Small	కున్నదు *kunnadu.*
Smarts, it	ఏర్సొ *érso.*
Smell (good)	వొళ్లెగములె *voḷḷegamule.*
Smell (bad)	నారొ *náro,* జిడివొత్తొ *jiḍivotto.*
Smile	కార్ధపె *kárdhape.*
Smoke	పొకె *poke.*
Snake	పాబె *pábe.*

Sneeze	ಟಿಪುಪೆ *tipupe.*
Snore	ಕುರ್ತಪೆ *kurtape.*
So	ಯಿಂಗೈ *ingai,* ಅಂಗೈ *angai.*
Son	ಮಗ್ಗೆ *magge.*
Sorcerer	ಬಿಲಿಕಾರನೆ *bilikárane.*

Sorcery (the Curumba pratices) ಕವಡೆ ವೊಡೆಸಿರ್ಕಕೊ *kavaḍe vóḍesirkako.*

Soul	ಉಸ್ಸುರೆ *ussure.*
Soil	ಬುಯಿಮಿ *buyimi.*
Sour	ಪುಜ್ಜಿ *pujji.*
Sorry (I am)	ದುಕಮಾಪೆ *dukamápe.*
South	ಟೆಕ್ಕೆ *tekke.*
Sow	ವಿತ್ತುಕಪೆ *vittukape.*
Speak	ಮಾನಿಕಪೆ *mánikape.*
Spear	ಯಿಜ್ಜೆ *yijje.*
Spend	ವೆಚ್ಚಗೀಕಪೆ *vechchagíkape.*
Speech	ಪರ್ಸಂಗುಮೆ *parsangume.*
Spine	ಬೀವೆ *bíve.*
Spittle	ಯೆಂಜಲೆ *yenjale.*
Spit	ಉಳ್ಳುವೆ *uḷḷuve.*
Spider	ಜೇಲ್ದೆ *jélde.*
Spoil	ಕೆಟ್ಟಿಸಕಪೆ *keṭṭisakape.*
Spot	ಯೆಡಮೆ *yeḍame.*

Staff	ತಸ್ಸೆ *tasse.*
Stand	ನಿಲ್ಲುಕಪೆ *nillukape.*
Star	ಮೀನೆ *míne.*
Spread	ಪರ್ತಕಪೆ *partakape.*
Sprinkle	ಸೊಟ್ಟಕಪೆ *soṭṭakape.*
Squeeze	ಹಿಂಡಿಕಪೆ *hiṇḍikape.*
Starve	ಪೆಟ್ಟಿಗೆ ಏಕೊ *peṭṭige éko.*
Steal	ಕಳ್ಳಕಪೆ *kaḷḷakape.*
Steel	ಉಕ್ಕೆ *ukke.*
Steep	ಅಟ್ಟೆ *aṭṭe.*
Stench	ಜಿಡಿ *jiḍi.*
Stink	ಜಿಡಿವಿಟ್ಟಿಕೆನ್ *jiḍiviṭṭiken.*
Step (noun)	ಹಜ್ಜೆ *hajje.*
Sting	ಕಟ್ಧಕಪೆ *katdhakape.*
Stool (to go to)	ಪೀತೂತಲ್ಹೋಗಪೆ *pítútalhógape.*
Stop	ಅಡ್ಡಗಡ್ಡಕಪೆ *aḍḍagaḍḍakape.*
Storm	ಕಾಟೆ *káṭe.*
Straw	ಪುಲ್ಲೆ *pulle.*
Stream	ಪೇಯೆ *péye.*
Strike	ಪುಯಿಕಪೆ *puyikape.*
String	ನೂಲೆ *núle*
Strong (man)	ಸದ್ದುಗಾರನ್ *saddugáran.*
Sucks (it)	ಊಟೊ *úṭo.*

Sugar — కల్లెనె *kallene.*

Sun — పొర్తె *porte.*

Sunday — ఆసవారమె *ásavárame.*

Sure — నెల్లమె *nellame.*

Swallow — నుంగివిట్టికపె *nungiviṭṭikape.*

Swamp — ఏకె *éke.*

Sweat — ఉరె *ure.*

Sweep — వొస్కపె *voskape.*

Sweet — సైవె *saive.*

Swell — వాతొ *váto.*

T.

Tail — వాలుమె *válume.*

Take — వేర్కపె *vérkape.*

Tall — ఉద్దు *uddu.*

Talk — మానికపె *mánikape.*

Tamarind — నబ్బుళి *nabbuḷi.*

Tax — కెండవణమె *kenḍavaṇame,* కజాన *kajána.*

Thatch — పుల్లెముచ్చుకపె *pullemuchchukape.*

Tempest — కాటె *káṭe.*

Ten — పత్తె *patte.*

Thirst — అర్పు *arpu.*

There — అల్లి *alli.*

Thief	ಕಳ್ಳನೆ *kaḷḷane.*
Thirteen	ಪದಿಮೂಡೆ *padimúḍe.*
Thirty	ಮೂವತ್ತೆ *múvatte.*
Tie	ಕಟ್ಟಕಪೆ *kaṭṭakape.*
Thorn	ಮುಳ್ಳೆ *muḷḷe.*
Thistle	ನೆಗ್ಗೆ *negge.*
Thread	ನೂಲೆ *núle.*
Three	ಮೂಡೆ *múḍe.*
Thumb	ಬೆಬೆಟ್ವರಳು *bebeṭvaraḷu.*
Thunder	ಗುಡಿಕು *guḍiku.*
Thunders, it	ಗುಡುಕೊ *guḍuko.*
Time	ಕಾಲಮೆ *kálame.*
Tiger	ಪುಜ್ಜೆ *pujje.*
Tinder	ತೂಡೆ *túde.*
Tobacco	ಪೊಕೆ *poke.*
Token	ಕುರ್ಪೆ *kurpe.*
Tongue	ನಾಲಗೆ *nálage.*
Tooth	ಪಲ್ಲೆ *palle.*
Touch	ಮುಟ್ಟಕಪೆ *muṭṭakape.*
Town	ಪಟ್ಟಣವೆ *paṭṭaṇave.*
Transgression	ತಪ್ಪೆ *tappe.*
Trap	ಗೂಡೆ *gúḍe.*
Treasure	ಬೊಕುಸಮೆ *bokusame.*

Tree	ಮರಮೆ *marame.*
Tremble	ನಡೆಗಿರ್ಕಪೆ *naḍegirkape.*
True	ನೆಲ್ಲೆ *nelle.*
Trust	ನಂಬಿಕಪೆ *nambikape.*
Truth	ಸತ್ಯ *satya.*
Tumble	ವಿದಿದ್ಧೋಗಪೆ *vididhógape.*
Turban	ಮಂಡೆಪೇರಿ *mandepéri.*
Tusk	ಪಲ್ಲೆ *palle.*
Turn	ತಿರಿಗಿಕಪೆ *tirigikape.*
Twelve	ಪಂನೈದೆ *pannaide.*
Twenty	ಯೀವಾಧೆ *yívádhe.*
Twig	ಜಿಲೆ *jile.*
Twilight	ನಡುಜಾಮ *naḍujáma.*
Twin	ಆವಿಲೆಮಗ್ಗೆ *ávilemagge.*
Twinkle	ಕಂಣುಹೊಟ್ಟಕಪೆ *kaṇṇuhoṭṭakape.*

U.

Udder	ಮೆಳೆ *meḷe.*
Ulcer	ಪುಂಣು *puṇṇu.*
Umbrella	ಕೆಡೆ *keḍe.*
Uncertain	ನೆಲ್ಲಮಿಲ್ಲ *nellamilla.*
Uncle	ಕೆರಾಳೈಯನ *keráḷaiyana,* ತಲ್ಲಾಳೈಯನ *talláḷaiyana.*
Under	ಕ್ಯೀಯೆ *kyíye.*

Up	ಮೇಕೆ *méke.*
Urine	ಮೊಳ್ ನೀರ *moḷníra.*
Understand	ಅರ್ಕುಪೆ *arkupe.*
Unjust	ನಾಯಮಿಲ್ಲ *náyamilla.*
Urge	ಬಲುಮುತ್ತಗೀಕಪೆ *balumuttagíkape.*

V.

Value	ವೆಲ್ಲೆ *velle.*
Vegetable	ಸೊಪ್ಪೆ *soppe.*
Venereal	ತುರ್ಕಫಂಣೆ *turkaphaṇṇe.*
Vertex	ಮಂಡೆಕೋಟೆ *mandekóṭe.*
Vial	ಪೆಟ್ಟಿಗೆ *peṭṭige.*
View	ನೋಟಮೆ *nóṭame.*
Violence	ಬಲಮುತ್ತ *balamutta.*
Voice	ದೈನೆ *daine.*
Vomit	ಕಾರ್ಕಪೆ *kárkape.*
Village	ಪಟ್ಟಿ *paṭṭi.*

W.

Wait	ಕಾಟ್ಕಪೆ *kátkape.*
Walk	ನಡೆಕಪೆ *naḍekape.*
Wall	ಗೋಡೆ *góḍe.*
Want, famine	ಪಂಜಮೆ *panjame.*
Want (I)	ಯೆನಗುವೇಕು *yenaguvéku.*
War	ಪೋರಾಟ *póráṭa.*

Warm	ವೇವೈಯೆಕೇಕಪೆ *vévaiyekékape.*
Wart	ಜಟ್ಟೆ *jaṭṭe.*
Wash	ತೋಯಿಸ್ಕಪೆ *tóyiskape.*
Waste	ಕೆಟ್ಟಿಸ್ಕಪೆ *keṭṭiskape.*
Water	ನೀರೆ *níre.*
Wax	ಮೆಕ್ಕೆ *mekke.*
Way	ಅಳಾರೆ *aḷáre.*
Weak	ಸಮ್ಮತ್ತಿಲ್ಲ *sammattilla.*
Wear	ಬೇವುಕವೆ *bévukave.*
Wealth	ಅದಾರ *adára.*
Wed	ಪೇಟುಕೊಳಕಪೆ *péṭukoḷakape.*
Week	ಎಟ್ಟುನಾಳೆ *eṭṭunáḷe.*
Weigh	ತೂಕಪೆ *túkape.*
Well	ವಾವಿ *vávi.*
Well, good	ವೊಳ್ಳೆದು *voḷḷedu.*
West	ಮಾರಲೆ *márale.*
When	ಯೇಗೊಳ *yégoḷa.*
What	ಯೇನೆ *yéne.*
Wet	ನಾಂಡೆ *nánde.*
Wheat	ಗೋದುಂಬಿ *gódumbi.*
Whistle	ವಿಳ್ತಿಕಪೆ *viḷtikape.*
Where	ಯೆಲ್ಲಿ *yelle,* ಯೇಯೆ *yéye.*
Whip	ಜಿಲುಕೆ *jiluke.*

Whiskers	ತಾಡೆಮೀಸೆ	*táḍemíse.*
White	ವೆಳಪೆ	*veḷape.*
Who	ಯಾರೆ	*yáre.*
Whore	ಸೂಳೆಮಗ್ಗೆ	*súḷemagge.*
Wide	ಅಗುಲುಮೆ	*agulume.*
Widow	ಮುದೆಗೇಡೆ	*mudegéḍe.*
Widower	ಮುಂದಿನೆ	*mundine.*
Wife	ಪೇಟೆ	*péṭe.*
Willow	ವೈಗೆಮರಮೆ	*vaigemarame.*
Wind	ಕಾಟ	*káṭa.*
Wipe	ವರ್ರಸಿಪೆ	*varrasipe.*
Wilderness	ಕಾಡೆ	*káḍe.*
Wing	ಪೆಕೆ	*peke.*
Wink (I)	ಕೈಸನಿಗಿಸುಪೆ	*kaisanigisupe.*
Witchcraft	ಪಿಲಿ	*pili.*
Wish	ಆವಲೆ	*ávale.*
With	ಸಂಗಡ	*sangaḍa.*
Wither	ವೊಣಗಿಹೋಗಪೆ	*vonagihógape.*
Within	ವೊಳೆ	*voḷe.*
Witness	ಸಾಕಿಸಮೆ	*sákisame.*
Woman	ಪೆಂಮಗ್ಗೆ	*pemmagge.*
Wood, forest	ತೇಳೆ	*téḷe.*
Word	ಮಾತೆ	*máte.*

Work (I)	ಕೇಕೀಕಪೆ *kékikape.*
Worm	ಪೂವೆ *púve.*

Y.

Yawn	ಆವಟ್ ವಿಟ್ಟುಪೆ *ávaṭ viṭṭupe.*
Year	ವರ್ಷಮೆ *varshame.*
Yes	ಹೂದೆ *húde.*
Yesterday	ನಿಯರೆ *niyare.*
Yield	ವೊಬ್ಬಕಪೆ *vobbakape.*
Yoke	ನೋನೆ *nóne.*
Young	ಜೌವಾನೆ *jauváne.*

The letter ೞ placed under other letters, for instance ೞ ಕಪೆ, has a sound peculiar to the Hill tribes, something like ழ in tamil, but not exactly so. It will be observed how many words terminate in é (ಏ). The frequent occurrence of this vowel, which the Kotas utter in a nasal pronunciation, makes their language any thing but agreable to the ear.

OCCUPATION OF THE HILL TRIBES.

Nearly the whole life of a Toda is spent in idleness. Except milking the Buffaloes and making ghee from the produce of their herds, no real work is done by the Todas. Even the milk business is to the greater part

performed by one man in each village, whom they call the Pālicārpāl, and who alone is allowed to go into the dairy, which is considered a kind of sanctum in each Mand. In the harvest time the men go about in all the Badaga villages, and raise their tax in grain, which they call *gŭdŭ*, and to which, the Badagas believe, they have, as the lords of the soil, a certain right, but I have been witness a great many times when it was only by the greatest force that the Todas could get something from their tenants. And if the Badagas were not afraid of their enchantment, they certainly often would refuse to supply the lazy fellows, whom they call Pitchekārar, with the means of their subsistence. Also the Toda women are as lazy as their husbands, and except preparing the meal for the family, do nothing at all. They sometimes during the absence of their husbands sit for hours together, talking and laughing, and curling their hair.

Though the Badagas also do not know much of the value of time, still they cultivate their ground, and in the sowing and weeding season expose themselves to the inclemency of the weather very much, and I have no doubt if they were more industrious, they could easily supply themselves with grain enough to live upon, but as this is not the case, a very large quantity of *Rāgy* comes up from the low country every week, which the Badagas buy and consume. The Badaga women are very industrious, and not for an hour they can be seen idle. If there is no work in the field, they bring firewood to the house, or do something else for the benefit of the family. Chiefly on this account a youth has to give a very large dowry for his wife, sometimes 150 and 200 Rs. because he knows her usefulness. Also they have more modesty, and are not so forward as the Toda women, at least not towards strangers. The Government tax, which the Badagas pay for their land and buffaloes, is comparatively high

but for a little bribery the Kanaka or village Accountant can always manage it to make it a little lower.

The productions of the soil are the following:—

1. Nilgherry wheat and Nilgherry barley.

2. European wheat and European barley introduced by Mr. Sullivan. Barley has degenerated very much; and for the last years, the Badagas preferred their own, because they had a better harvest of it. Formerly it was the contrary, and also this year having had plenty of rain, the *Dorre gānje i. e.* Gentleman's barley looks beautifully.

[Vetches and oats were also introduced by Mr. Sullivan, but the natives did not make any use of it.]

3. The most common grain is what the natives call *Korrali,* which is a very rough kind of millet, and grows in the colder districts Kundenád, and Mekanád, where the other finer grains do not grow. As they cultivate the same piece of ground, only every 3d or 4th year, it grows very well without manure except the bushes, which are cut down and burnt.

4. *Sāmé* (panicum miliare) which is considered the best kind of the several small grains of the Hills. If grows in the warmer districts, it must have richer soil than *Korrali.*

5. *Ténnéy* or *Navoney* (panicum italicum) which also grows only inwarm places. It is considered indigestible, on which account only a small quantity is cultivated and always eaten mixed with some other grain.

6. *Varagu* (paspalum frumentaceum) which grows only on the slopes of the Hills in feverish places, and requires, it seems, a warmer climate than the Hill plateau affords.

7. *Ragi* (cynosurus corocana) grows also only in places where the cold monsoon wind cannot come to. This grain the natives say will remain good for 30 years if it is kept in dry places.

8. A kind of pea (cicer arietinum) generally sown when the *Ragi* is cut down.

9. *Manalige* (a kind of lentil) used for currystuff.

10. *Meté* (trigonella fœnum græcum) sold to the low country merchants.

11. Onions and garlic very small but of a fine flavour. They are generally sold to merchants, who come up from Coimbatoor, and carry large quantities down on bullocks.

12. Opium of a very good kind, the curse for many of the inhabitants of the Hills, who use it first as medicine against any disease they are troubled with, and then get incurable opium eaters. Many of the Kotas boil the shells of the poppy to get a stupifying beverage from them.

13. *Pasambu* (calamus aromatícus) is not cultivated but grows nearly in every swamp, and is sold to the Coimbatoor merchants.

II. *On the Geological age of the Sandstones containing Fossil Wood, at Trivicary, near Pondicherry. By* H. F. BLANFORD, *of the Geological Survey of India.*

THE sandstones occurring at the village of Trivicary near Pondicherry have long been known to Indian Geologists from their containing in considerable quantity the silicified remains of the stems of trees. These beds were first brought to public notice, by the late Mr. Kaye, of the Madras Civil Service, in his paper on the Geology of the Country around Pondicherry, published in Vol. Part of the 6th Transactions of the Geological Society of London. In the same paper are also described certain other sandstones occurring at the village of Verdoor Valudayur, four miles South East of Trivicary, and a large series of fossils collected from these rocks, by Mr. Kaye, and Mr. Brooke Cunliffe, were sent home and described, by the late Professor Edward Forbes, in the admirable Monograph which accompanies Mr. Kaye's paper. From these fossils Professor Forbes determined the Verdoor sandstones to be of cretaceous age, and he stated his opinion that they were about coeval with the lower cretaceous or Neocomian rocks of Europe. The age of the Trivicary sandstones however still remained doubtful, and no decided opinion was enunciated on the subject, until in the course of last year, Mr. Adolphe Schlagentweit published in the Journal of the Asiatic Society of Bengal,* his "Report on the Progress of the Magnetic Survey, &c. from November 1855 to April 1856."

In this Report Mr. Schlagentweit having described the great series of sandstones and plant-bearing beds throughout Central India and portions of Bengal, and assuming the Trivicary sandstones to be of the same age, says:—"With reference to the difficult question of the age of the sandstone formation, it is worth mentioning that I have seen the sandstone with fossil trees clearly overlaid by the cretaceous strata, the Pondicherry district, so that it cannot be younger than Jurassic," and further on:—"The cretaceous strata seem to have been quite undisturbed; they rest horizontally upon the oolitic sandstones of Trivicary, and upon the crystalline schists in other localities," and as these sandstones coin-

* No. II for 1857.

cided with an opinion on the age of the sandstones of Central India previously put forward, by Mr. Hislop,* the question seemed so far decided, viz. that the Trivicary sandstones were older than the cretaceous epoch and in all probability Jurassic.

In December last, the Madras party of the Geological Survey of India, commenced the detailed survey of the South Arcot and Trichinopoly Districts, and proceeded in the first place to examine the relations of the Trivicary and Verdoor sandstones in order to gain a distinct knowledge of their relative superposition before tracing out those rocks into other portions of the district. This portion of the work has been now completed, and the result is that the relative superposition of the beds in question proves to be precisely the reverse of that which Mr. Schlagentweit imagined to be the case. As this is a subject of somewhat critical distinction, and will in all probability prove of great importance to the true comprehension of the geology of a large portion of India, it is advisable to state in some detail the grounds upon which the above determination has been arrived at.

Immediately to the east of the village of Trivicary and stretching thence for a distance, of about half a mile in the direction of Verdoor and Pondicherry, are a series of small irregular sandstone bluffs much eroded by the denuding action of fresh water, and forming a prominent and striking feature in the surrounding landscape. On near inspection these bluffs are seen to be composed of coarse sandstones much false-bedded and irregularly banded with brilliant tints of lilac, orange, pink, white, &c.; they are rarely conglomeritic, considerable quantities of silicified wood are scattered over the surface of the ground, and here and there large masses of the same are seen protruding, from the sandstone in *situ*. The sandstones are of no great thickness, for so far as can be judged they appear to be nearly horizontal and on their western boundary or towards the village of Trivicary, are seen in several places resting immediately on the crystalline rocks, which everywhere form the bottom rock of the country. The small bluff which bounds this elevated patch of sandstones, is very conspicuous both in its west-

* Quarterly Journal Geological Society of London, Vol. XI. p. 457.

ern and eastern limits in the neighbourhood of Trivicary, but to the north it dies away gradually, and the sandstones themselves disappear beneath a thick covering of soil, and are only occasionally visible when laid bare in the beds of the small water-courses. A thick deposit of sandy soil laps in a similar manner, round the foot of the eastern bluffs and conceals the underlaying rock, except in the immediate neighbourhood of the river, where gneiss is seen in *situ*, and from its position, is evidently cropping out from beneath the sandstones. Cretaceous rocks resembling those at Verdoor are no where seen in contact with these beds except that at one point an isolated block of yellow sandstone containing cretaceous fossils, which from its appearance, I judge to have been recently dug up, from the soil on the spot on which it rests, is seen at what appears, to be the boundary of the sandstones. No cretaceous rocks whatever are here seen in place.

There is great reason to believe, judging from the color and appearance of the soil* that from Trivicary, the tree-bearing sandstones extend for some distance to the East and overlap a portion of the cretaceous rocks, as shown in the accompanying map and section, but as in the absence of any sections on any rock whatever seen in *situ* over this tract of country, it is impossible to *prove* the fact, we must seek elsewhere for reliable proofs of superposition, and to do this, we pass to the country between Verdoor and Pondicherry.

About two miles N. W. of Pondicherry, the Madras road ascends and passes for about three miles over a tract of elevated country, characterized by a red sandy soil, from beneath which a lateritic gravel is dug in places to metal the road. This elevated tract extends from the south east corner of the great Oosatary tank, four miles west of Pondicherry to the village of Mundakuppam on the coast 10 miles north of Pondicherry and along the greater part of its boundary is terminated by a small escarpment of about 30 feet average elevation. The streams which carry off the drainage of this little plateau have cut deeply into the rocks composing it at several places along the escarpment, and expose Oosatary gritty sand-

* This character, vague and unreliable as it may appear, has been found to be an excellent indication of the presence of certain rocks throughout the district.

stones and conglomerates, sometimes of a deep red color, at others mottled and banded with various colors, and containing occasionally, although rarely, large unrolled fragments of silicified wood precisely similar to those found at Trivicary.

To the east of the Oosatary tank the sandstones are especially well exposed in the *gullies* cut by several small streams flowing down to the tank, and may be seen at several places, resting on finely grained soft yellow sandstones which contain in some places a few very imperfect but recognizable cretaceous fossils and are proved to be the upper beds (as here seen) of the cretaceous series. It is therefore beyond the remnant of a doubt that the coarse sandstones of Pondicherry, are newer than the cretaceous beds.*

The next step in the investigation is to trace out the identity of these beds, and the coarse grits at Trivicary. In ascertaining this point the greatest care has been exercised, and the two areas were repeatedly and alternately visited in order to compare thoroughly the two series. The results of this investigation are:—

1st. The sandstones at Trivicary, and those at the Oosatary tank present precisely the same lithologic characters. They are both very coarse ferruginous grits containing minute particles of what appears to be kaolin interspersed with the grains of sand and giving them a white speckled appearance. In both localities, they are very variable in color, but the most characteristic varieties both at Trivicary and the tank are variegated, with irregular bands of lilac, pink, and yellow, frequently very brilliant in color. They are both occasionally somewhat conglomeritic especially towards the bottom, and in their false bedding, their irregular segregation and all lithological characteristics, they are quite undistinguishable.

2nd. The Trivicary grits contain fossil wood in great quantity, while the Oosatary beds contain it only very sparingly, but it is in both places apparently identical, and in both cases perfectly silicified and unrolled. Moreover, that the abundance of fossil wood is a very local character, is proved by the fact, that in the evident extension of the Trivicary sandstones to the North, the fossil wood

* The extension of these sandstones to the south of Cuddalore is seen in many places resting on the cretaceous rocks very unconformably. At Verdachellum they rest on the lowest beds of the cretaceous series whereas 20 miles to the south of this, they are seen resting on beds about 3,000 feet up in the same series.

seems entirely to disappear, at the distance of about 2 miles, whereas the Oosatary beds are 8 miles distant.

3rd. Both at Trivicary and towards the coast, the sandstones form an elevated tract bounded by a small escarpment, more or less perfect. The similar developments of grits to the southward, such as those occurring at Cuddalore in the Capper Hill, and at numerous other places since visited, by the Survey are all similarly characterized. Indeed, the continuity of the Oosatary beds and those of the Capper Hill, has only been destroyed by the breaching action of the Panar and Ariancupom rivers, and the interspace is now occupied by the alluvium deposited bythese rivers.

4th. Whenever throughout the district, the bottom beds of the cretaceous series have been seen, they rest immediately on the gneiss, whereas, as has been mentioned in the note p—the southern extension of the Oosatary beds rests very unconformably on the cretaceous rocks, so much so that it is easy to be comprehended, that at Trivicary they should overlap these latter, and rest also on the gneiss.

5th. From these results which have been verified by repeated examination, the only legitimate conclusion that can be drawn, although in distinct opposition to Mr. Schlagentweit's statement, is:—*that the Trivicary sandstones are identical with those of Oosatary, therefore newer than the cretaceous beds and unconformable to them,* the cretaceous rocks having been upheaved and denuded partially only at the Oosatary tank and other places, entirely at Trivicary, previous to the deposition of the tree-bearing sandstone. That Schlagentweit should have been mistaken, in his reading of the Geology of Trivicary is no more than might have happened to any one who made so very cursory an inspection of this rather difficult district as that gentleman, for it will be observed from Mr. Schlagentweit's report that in the space of one fortnight, viz. from the 24th April to the 10th March, he visited the whole of the country between Madras and Trichinopoly, and travelled thence to the Neilgherry Hills, a distance altogether of 370 miles. It is however exceedingly to be regretted that any man of acknowledged scientific attainments should make so decided a statement as that quoted from Mr. Schlagentweit's paper, especially on a point of really critical im-

portance such as the present is, unless he has fully and carefully satisfied himself of its absolute certainty. A statement so distinct as Mr. Schlagentweit's would never be questioned by any one, who had never visited the locality referred to, and how much false reasoning it may give rise to, may be seen by perusing Mr. Schlagentweit's own paper, wherein from the single observation at Trivicary, the author rests his inference of the age of the great sandstone and plant-bearing series of central India and Bengal.

It is difficult to imagine what Mr. Schlagentweit could have been thinking of that could lead him to make so positive a statement as that quoted; the cretaceous rocks, especially those of Pondicherry, differ so markedly in appearance from the tree-bearing sandstones that it is scarcely to be supposed that Mr. Schlagentweit mistook any of the upper beds of the tree-bearing grits for cretaceous rocks, and yet this seems the only possible explanation of the error, for the contour of the ground, and the dip of the beds, so far as can be made out, would rather point to a different conclusion. As Mr. Schlagentweit has however promised a detailed account of his Geological observations in India, he may possibly be able to throw some light on the cause of his mistake.

POSTSCRIPT.—The above paper was written in camp shortly after the survey of the country of which it treats, and where I had but very few works of reference at hand. I was thus unaware of a fact, which I have now great pleasure in acknowledging, viz., that the true order of superposition of the Trivicary sandstones with reference to the cretaceous rocks of Verdoor was fully known to Captain Newbold, who published his notes respecting these rocks in the Asiatic Society's Journal, Vol. XIV, and subsequently in his paper on the Geology of India, published in Vol. IX of the *Calcutta Review*, stated his views on this subject very clearly. I deem myself fortunate that an accidental delay in the publication of my paper has afforded me an opportunity of supplying a grave omission, and of doing an act of justice to one of the most philosophical and energetic of that noble band of investigators who have been the voluntary pioneers of Science in India.

III. *Notes Antiquarian and Mythical.* *By* M. J. WALHOUSE, ESQ., C. S.

I.

THE worship paid to rough stones is a curious and widely spread feature in the ancient religions, and in the majority of its phases appears to have been connected with that phallic or lingam worship, which now confined to India, prevailed in early times throughout Southern and Western Asia, and even penetrated into Europe. It is the object of this notice to bring together some of the more remarkable indications of its existence; though in such an attempt there is always the danger of repeating what has been before presented in the many scientific publications of the day, possibly in this very Journal. None however can pretend to be acquainted with all that is, and has been published, on any particular subject, for the rest "*pereant malè qui ante nos nostra dixêre.*"

The shape in which the reproductive power is popularly typified in this country is well known; from the rude elongated stone set up under every green tree, to the massive cylinders of hewn rock, black with oil, in their celled shrines, in the τεμενος of some ancient pagoda. There is a conspicuous instance at a remarkable point where the Cauvery after running 50 miles through an almost untrodden wilderness of hills and jungle eastward from the Falls of Sivasamudram, turns south on its way to the rice-fields of Tanjore. At the bend the river spreads into a broad expanse, the banks level with the water, and from the middle of the flood a column, apparently of white smoke arises and drifts away upon the wind. This remarkable appearance is due to some deep hidden chasm into which the water falls and sends up a cloud of spray-mist: but standing, as one does, on a level with the water, no rocks or cleft are visible, and the wreath of vapour ascends, precisely like smoke, from the seemingly unbroken bosom of the stream. This spot is called—a Canarese dialect prevailing there —Hogênakallu (smoke-rock) and immediately opposite it on the eastern bank stands a hoary old pagoda round whose inner enclo-

sure is arranged a long line of 10 or 12 huge lingam stones, each in its separate cell.

Returning to the vestiges of lingam worship in very ancient times, evidence is not wanting of its prevalence under its worst aspect in Phœnicia—the scriptural Canaan—from whence it crept into Palestine itself, nay, as Mitchell has shown with the highest probability into the very Temple of Jehovah. In the account in Kings and Chronicles of the idolatries introduced by the wicked King Manasseh, he is said to have " set a carved image, the idol which he had made, in the house of God," and " a graven image of the grove that he had made in the house," &c. In the words rendered " carved images" the learned Bate and Porkhurst both unite in seeing an idol dedicated to licentious rites, the same with that image stigmatised as " provoking to jealousy" which Ezekiel saw defiling the gate of the altar, and closely connected with that idol the setting up of which induced Asa to depose the queen-mother Maachah. The nature of the idols as not directly mentioned, the Scriptures preserving a marked silence on this point throughout their record of the abominations introduced by the idolatrous Jewish monarchs, but may be at once inferred when it is known that the radical letters of the name of the idol set up by Maachah present the identical word *phallus*, which, without meaning in Greek, becomes plain enough when referred to its Hebrew derivation. The punishment inflicted by the righteous Asa on his own mother shows his sense of her enormity, and the haste made by Manasseh to remove that particular image from the house of God, when chastisement befell him, manifests the deep guilt of its introduction there.

In the second or Mosaic covenant, under which the Jewish polity was finally consolidated, it is written " Thou shalt not plant thee a grove of any trees near unto the altar of the Lord thy God, which thou shalt make thee : neither shalt thou set thee up any image (pillar) which the Lord thy God hateth." (Deut. xvi, 21, 22.) Elsewhere in the first or Divine covenant, and throughout the Prophets, the erection of " groves" and " statues" is undeviatingly denounced as the most offensive form of Canaanitish idolatries. When in addition to the " graven image of the grove" set up by

Manasseh, we recal Josiah's "bringing out the grove from the house of the Lord without Jerusalem, unto the brook Kidron, and stamping it small to powder," it is plain that in these and several other passages, to be intelligible, some other meaning must be attached to the word rendered "grove." That word in the original is Ashera, and Gesenius thinks that wherever it occurs it signifies an idol, though Porkhurst from the expression 'plant' and 'trees' is of opinion that in the above quoted prohibition at least a grove must be meant. As has been observed, however, the word translated *trees* is a noun singular, and the command may be understood as forbidding to set up an Ashera of any kind of wood (compare Isaiah xliv, 14 to 19.) The Asherim were nearly always connected with certain pillars, mistranslated statues in the authorised version ; it is not necessary to go into the evidence for believing these pillars to have been of a most abominable character, heightened probably by a revolting addition ; it is enough to point out that the setting up of the Asherim or the pillars, usually the two together, is invariably denounced as the deadliest crime of the apostate Kings, whether of Israel or Judah. Against them the indignation of the Prophets burnt hottest, and the express commands to break and hew them down marked them as the particular objects of divine wrath. (Exod. xxxiv. 13. Deut. vii. 5.) On the nature and worship of these pillars and the Ashera idol there is no direct testimony, but when we find Herodotus declining to enter into particulars of the rites of the country from whence they were derived on account of the pain and loathing it would cause him, and call to mind some of the Jewish laws directed against the practices of the Canaanitish temples, it is easy to conjecture the reason of the guarded silence maintained by Scripture on the point. Enough that there are good grounds to conclude that the Ashera rites included lingam worship in its grossest form and with its most polluting ceremonies. The very tradition has now disappeared from that land, whereas there is weighty reason to think, it profaned in its worst shape the very house of God ; so too may it pass away from the regions where it lingers latest.

In succeeding times the signification of the lingam emblem appears to have become forgotten or obscured, as in some degree it

is in India.* Tacitus in his Histories (II. 3) describing the temple of Venus in Cyprus says, " the image of the goddess is not in human shape, but an elongated circumference, broader at base and tapering in girth upwards : its meaning obscure." And Maximus Tyrius in his 38th Essay writes " The Paphions adore Aphrodite, but her image you could liken to nothing but a white pyramid." Taken in connection with aphrodisiac worship what could these have been but lingams ? Herodian in his 5th book thus describes the image of the Sun at Emesa, called by the Phœnicians Elaiagabàlom, and worshipped not only by them but by the neighbouring kings and satraps. " It has no form of a statue, but is a very large stone, round at bottom, and tapering sharply conelike, its colour black ; it is said to have fallen from the sky, and to be an unformed image of the sun." Probably a meteorite, uniting both solar and phallic worship—rites, as could be largely shown, almost necessarily running into one another. In other instances when we find Lucian in his Pseudomantis saying of a religious fanatic " that if he should anywhere see a stone anointed with oil or crowned with flowers, he would straight fall down and worship it for a long time, beseeching good luck of it," and Theophrastus in his characteristics of a superstitious man describing him " on passing by an anointed stone in the cross-roads, as taking oil from a little flask, falling on his knees and adoring it," we have only to walk along any Indian road to perceive the kind of stones referred to, anointed and garlanded the same as those of classic days.† The stone said to have been devoured by Saturn in mistake for Jupiter and relat-

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* It is noteworthy that whereas in India the *lingam* assumes a conventional and inoffensive shape ; the *phallus* in Asia Minor and the antique world generally was in the grossest and most objectionable form. Hence though the latter was familiar to the ancients, the former when it occurred was misunderstood by or unintelligible to them. It should not be overlooked that the phallic type in its most exaggerated form, was especially connected with Bacchus *as conqueror of India.* Witness the two colossal phalli, each 300 fathoms high, placed by Bacchus in the vestibule of the great Syrian temple, *after his return from his Indian expedition.* (Lucian, de Syriâ Deâ.) In that most prodigious of recorded processions, the great Bacchic pomp celebrated by Ptolemy of Alexandria, we read of a golden phallus 120 cubits high, crowned by a bright golden star 6 feet round. (Athenæus, Lib. V.)

† A friend writes that in the Kunawur Province and high Himalayan villages a stone is set up as a pillar in the fields, its centre and top smeared with white wash, and the top marked with five finger-marks of red ochre ; on this flowers are offered for the prosperity of the field. So too in Southern India the whitewashed splinter of stone, tipped with red, may everywhere be seen placed under a tree in fields or gardens, crowned with a few flowers.

ed by Pausanius to be placed in the temple at Delphi, and anointed daily with oil, seems very like a lingam. The practice of anointing stones with oil dates from the days of the patriarchs, and is no doubt the cause why in most instances sacred stones are described as black. Porphyry informs us that the Deity was represented as a black stone as being of obscure and inscrutable nature. The ancient Arabians, says Maximus Tyrius in the above cited Essay, " Worship I know not whom, but the image I saw was a quadrangular stone," from Suidas we further learn it was black, and is evidently the same meteoric stone now preserved in the Caaba at Mecca.‡ The chief idol of the Germanic tribes, the Hermansaul, appears to have been at first a tall black stone. In Gladwin's Clyeen Akbari is mentioned a pillar of black stone, octagonal, and 50 cubits high before the gate of the Temple of the Sun at Jaganath. A good Mussulman must needs be a bad mythologist, but it is hard to conjecture what could have led the Emperor to see a sun-temple at Jaganath. Hindu fanes do not readily change, and nothing of the sort can be gathered from an account of Puri and Jaganath published some years ago in English by an intelligent native. Were it so, there would be a remarkable coincidence between this and the Phœnician sun-pillar the Elaiagabâlom. Captain Hamilton, apparently referring to the same object, describes an idol at Jaganath as a huge black pyramidal stone, (it must exist there now, qu. how is it regarded ?) Similar was the Siamese Sommonocodom. In Masson's Travels the idol of the mysterious Sia-posh of Central Asia is affirmed to be " an erect image of black or dark coloured stone the size of a man." The aboriginal tribes of Rajmahal worship a black stone in an enclosure.

The foregoing instances give evidence of the wide diffusion in ancient as well as in recent times of a black stone worship in which the symbol, nearly always of a peculiar shape, appears to have been, more or less openly, an emblem of reproduction. In some cases the signification may have become obscured, but that

‡ Hardly less remarkable have been the fortunes of another black stone, that on which the King of Ireland was crowned, called the Stone of Destiny ; if the coronation was auspicious it emitted a clear sound. This palladium or national talisman, was afterwards brought to Scone, and thence carried to Westminster, and placed under the old coronation chair, where it still remains.

such was generally the original meaning can be as little doubtful as that the May-day dances and poles in England are a relict of the phallic rites of Pagan times. Setting aside the Druidical upright stones, generally sepulchral, and the figured or scriptured stones, so perplexing to antiquaries in Scotland and elsewhere, there seems to have been a tendency in primæval races to deify mere rough stones or at least to choose them as symbols of their gods. Even in the sacred writings Jehovah is emphatically called the Stone of Israel—the Rock, (Gen. xlix. 24, Deut. xxxii. 4, 30, 31,) and Jacob called the stone he erected at Shalem El elohe Israel—the God of Israel, (compare Exod. xvii. 15,) but these plainly referred to the idea of strength and steadfastness. The Alexandrine Chronicle relates that the Assyrians first set up a rude pillar and worshipped it as a god, and Pausanias, expressly affirms that in the most ancient times amongst the Greeks rough stones (*ἀϱγοι λιφοι*) were reverenced instead of images. The same author mentions that Hercules was represented at Hyetta by a rude stone according to ancient usage. So was Juno at Samos, and even the Graces at Orchemenos. The ancient Laplanders worshipped rough stones, called Seitch, and the adoration paid to the same objects formed a principal feature in the religion of the Arabians before Mahommed. Eusebius says the Earth was symbolised by a cylindrical stone, and Mr. Masson reports that in the temple dedicated to the goddess at the foot of the Kah Assa Mahi (Hill of the Great Mother, *i. e.* Nature,—" Magna Mater.") Near Cabul " a huge stone is the object of adoration." Michelet sees traces of stone-worship in France in the numerous towns bearing the name of Pierre Fiche, *i. e.* a rough unwrought stone simply fixed in the ground like a post.

It is not easy to penetrate the idea that led so many people in such various countries, periods and stages of development, to select rude stones, rather than other natural objects as emblems of their religious conceptions. The sentiment is conceivable that deified the sun, the heavenly bodies, the cow, rivers, &c. and a striking aerolite might here and there rivet the awe and worship of the surrounding tribes, but it is not so clear why common shapeless stones should so generally have been elevated to divine honours.

Possibly a remnant of the old chaotic fetish worship of half-conscious man ; then as the mind opens, the first abstract idea that develops itself in primæval races is of that reproductive energy of Nature which, more or less veiled, is the ultimate idea and principle underlying all heathen systems and deities. And of this the earliest and rudest expression would be some form of the lingam, most readily typified by the stones scattered around. But the whole assumption may be questioned, and is beset with difficulty and incoherencies.

II.

In the Reverend W. Taylor's "Oriental Historical Manuscripts" Vol. I. pp. 112-114, there is an account from an old Tamil Chronicle of a contest held between the Samanal or Buddhists and the Brahmans, in which both parties submit their respective claims to orthodoxy to this ordeal, viz., that each writing a prayer or charm upon palm leaves, and casting the same into a river, that side whose leaves should ascend against the stream should be declared to hold the true faith. Upon trial every leaf of the Samanals was carried down with the stream, and those of the Brahmans alone ascended. The former, 8,000 in number, notwithstanding the miracle, refusing to be convinced or accept the Saiva faith, "with obstinate prejudice" (saith the Brahman chronicler) "put themselves on the impaling stakes," the penalty previously agreed upon for the losing party. Mr. Taylor in his notes at pages 182-183, states that the impalement of this army of martyrs is unquestionably a historical fact, and commemorated to this day by a mimic representation. He is further of opinion that Buddhists, Samanals, and Jainas are terms denoting substantially the same sect. It is upon the name Samanal (சமணன்) that a few remarks occur. Adverting to Sarmana Cardama, the son of Mahiman, a form of Siva, identified with Gantama or Buddha, and the same with the Siamese Sommono Kodom, Mr. Taylor conjectures Sommono and Sarmana to be the origin of the term Samanals, and dialective variations of Sarvamanu, an universal or very illustrious sage. Porphyry makes particular mention in his work De Abstinentiâ (Lib. iv. cap. 17) of a sect called Samandans, who appear to have been great travellers and proselytisers, and to have had a kind of

monastic discipline. Faber has this passage. " Both Cyril and Clemens Alexandrinus agree in telling us that the Samandans were the sacerdotal order both in Bactria and Persia ; but the Samandans were the priests of Saman or Buddha, and it is well known that the sacerdotal class of Bactria and Persia were the Magi : therefore the Samandans and the Magi must have been the same, and consequently Buddha, or Maga, or Saman must have been venerated in those regions." Pagan Idolatry, B. iv. chap. 5. To this conclusion (so notably Faberian in hunting a verbal resemblance) that the Magi and Buddhists were the same, few would probably now assent. With equal reason might it be asserted that the rude Shaman priests and tumultuous Shamanite ceremonies of Northern Asia, which have been shown by Mr. Caldwell, not merely to resemble, but to be absolutely identical with, the popular devil-worship of the rural Tamil castes, are the same with the philosophic Samanal Buddhists. But with respect to the names Samanal, Saman, the following passage from M. Adolphe Pictet on the Cabiri may be adduced, carefully abstaining however from entering far into a subject so obscured by mysticism. " He in whom this (the Cabiric) system finds its unity is Samhan, the judge of souls, who punishes them by sending them back on the earth or to hell. He is Master of Death, on the eve of the 1st November he judges the souls of those who had died in the preceding year : that day still goes by the name of Samhan's night. Samhan is the centre of the association of the Cabiri ; *sam*, *sum*, *cum*, imply union in a multitude of languages."* Turning to Rottler's Tamil Dictionary we find *sub voce* " Saman, *the regent of death*, same as Yama," and Sami or Avhat is the deified sage or god of the Samanar or Buddhists. This coincidence, functional as well as verbal, is almost too strong to be accidental. No theory even has sought to establish any connectisn between the mysterious worship of " the great gods of Samothrace," and the Buddhistic system. If, however, Pictet and also Schelling be right, in interpreting the Cabiric theology as a worship of the primal powers of nature, ascending

* The derivation from " sam" union, certainly seems preferable to Mr. Taylor's derivation from Sommono (unless that too be from the same root.) It is noticeable that in the account of the contest the name of the Brahman (in truth Siva in disguise) who defeated the Samanal is Sampanton, *i. e.* " agreement," upon which meaning of the name there is an equivogue in the original story.

through a series of stages and developments up to the great central creative unity, and so the reverse of a system of emanations, it includes one main point of agreement with Buddhism, a capital distinction between which and Brahmanism is, that whereas the latter is always inclined to the idea of avatars or divinities descending and becoming visible in earthly forms, so Buddhism contrariwise elevates its sages and heroes through successive ascending states to one of identification with pure deity. Buddhism too has always been an eminently migratory creed ; Porphyry notices the wandering propensities of its professors, and in this it again coincides with the Cabiric divinities, Hercules, Jason, Œneas, Dido, and other mythical personages, all notable wanderers of old. Here are lesser likenesses, besides that crowning one of identity of name and function between the heads of the respective systems. All may be mistake ; but when one recalls the unexpected agreements, strange coincidences, and unaccountable correspondences with various Buddhist peculiarities, that sometimes essential, sometimes trivial, crop out in so many far separated countries, creeds, and ages, one is almost disposed to listen to those keen partizans who would extend the sway of Buddha from uttermost east to farthest west —to Britain and Ireland ; not scrupling to claim even Stonehege as a Buddhist temple. Shadowy glimpses in "the dim backward and abyss of time" of a period in unrecorded antiquity when Buddhism formed a vast, primitive, universally prevailing system, into which, at or after the historic epoch, Brahmanism in the east and manifold mythological religions in the west, broke and eventually overthrew. Fading for ever from the western world, in which the vestiges of its predominence only perplex, re-appearing at times in India, always to be subdued, but lingering in some of the adjacent countries, the antique faith in its unapproached strongholds of the remotest east, still counts its myriads of followers, outnumbering those of any other creed. One is sometimes tempted to speculations like those, were there any solid basis to build them on.

III.

Analogies have been traced between Asiatic mythologies and the religion established in ancient Scandinavia by Odin, who is

supposed by some to have led his Asen—Asian or Scythian hordes—from the regions between the Euxine and Caspian to Northern Europe, but the Chinese mythology has generally appeared to stand alone and unconnected. There is, however, one striking myth common to Scandinavian and Chinese traditions. According to the Woo-yun-leih-nien-ke, as given in Gutzlaff's "China Opened," Vol. I. p. 299, "an original etherial principle by its vapour impregnated matter, so as to produce Heaven and Earth, and the Yong and Yin, and having become pregnant, Pivankoo the first of this race was born, when he died the hair of his body was metamorphosed into wind and clouds, his voice into thunder, his left eye became the sun, the right the moon, the various members of his body the four poles and five high mountains, his blood and fluids rivers and streams: his sinews and arteries were changed into land, the hair into stars, the teeth and bones into minerals, and the vermin adhering to the body were transformed into men." This myth is identical with the story in the Edda of the giant Ymir, a personification of chaos or unformed primal matter who was born from the living drops that were formed from the melting of the icy vapours exhaled from the abyss. Whilst he slept a man and a woman sprang from an extraordinary sweat under his left arm. Odin and his brethren slew him, and formed the universe from his body precisely as in the Chinese legend: his scull became the vault of heaven, his brains were tossed up and became the clouds, his teeth and bones formed the rocks and hills, his blood and juices the sea and rivers, his flesh the earth, &c. It is remarkable that so peculiar a myth should appear in the cosmogonies of such very widely separated and dissimilar countries as China and Scandinavia, exactly corresponding in both, and apparently peculiar to them.

IV.

In Herr von Werne's adventurous voyage up the White Nile, the furthest region he attained was the country of the Bori in 4° North latitude; he describes it as inhabited by "an exceedingly numerous nation of tall and powerful build, the men six and a half to seven French feet in height, equal to 7 and 7½ English feet,—colossal figures, admirably proportioned and magnificently limbed, black, but with nothing of the usual Negro character in their

features." Rumours of this giant race have floated down from the remotest times. They are the famous Ethiopians most blameless of mortals, whose banquets, as Homer reports, were graced by the presence of the Olympian gods themselves, and who five centuries after were spoken of by Herodotus as "the tallest and most beautiful of the human race." They were the "mighty men," and "Sabæans, men of stature" of the Hebrew prophets, and it was their king Zerah who marched against Solomon's great-grandson Asa with a thousand thousand men and three hundred chariots.* Later still Agatharchides, and after him Diodorus Siculus, speak of them under the same appellation as that used by the German explorer of the present day, namely, the Megabari—so unchangeable are primitive names. Scripture and ancient authors abound with testimonies to the power, civilization, and commerce of the Ethiopians who founded Meroë, and dwelt in the countries about the upper streams of the Nile, and who, as Egyptian arts and civilization certainly *descended* the Nile-valley, may perhaps have been the progenitors of the wonderful monarchy of the Pharaohs. The origin of this people which in the remotest ages developed arts and commerce in the heart of Africa, whither we are only now beginning to penetrate, has awakened much speculation, and India has been pointed to as their probable cradle. Heeren favours the theory of their Indian origin, and there are a few incidental testimonies to it, which, though not conclusive, may be brought forward in the absence of more weighty proof, and have also been not generally noticed. In the life of that problematical character Apollonius Tyanæus, a book of little authority or value, except as a repertory of travellers' stories and legends current in antiquity, the philosopher, after reaching India, and when conversing with the Brahmans, is told the following story by Jarchas, their chief. "There was a time when the Ethiopians inhabited those regions, for in truth they are an Indian race, but Ethiopia was then unknown. Egypt then commenced at Meroë and the Cataracts and terminated at the mouths of the Nile. At that time the Ethiopians dwelt in these countries under the rule of king Ganges; the earth was fruitful, and they were in favour with the gods. But they mur-

* II. Chronicles xiv. 9.

dered the aforesaid king, after which they were held impure by the other Indians, and the earth refused to let them abide longer in these regions, for she destroyed all seeds that were sown, refused nourishment to the flocks and cattle, caused abortions, and if a town was commenced, she sank and overthrew the houses. Moreover the shade of Ganges followed them whithersoever they went, driving them in terror, and they were not freed from this curse till they had buried his murderers alive. Now Ganges was ten cubits tall, and the goodliest man ever seen, and the son of the river Ganges. Wherefore as his father would sometimes inundate India, he turned his course towards the Red Sea and caused him to become propitious to the land of India. Hence the earth returned him abundance when he was alive but avenged his murder. He built 60 cities, the most splendid in the country, and also drove back the Scythians, who had marched an army over the Caucasus into these regions ; and he buried seven adamantine swords in the ground to the end that no danger or panic should ever invade this country." This seems a very Indian legend ; its very indistinctness smacks of a Hindu origin. Some great religious feud and consequent emigration* may be veiled by it. The great stature of Ganges should not be lost sight of in connection with the national tallness of the Ethiopians, ancient and modern : the legend also contains one of the few direct allusions to a Scythian invasion of India. Again

* The Puranas have a tradition of the migration of Charma or Ham, with his family and followers, driven from his country by the curse of Noah ; that having quitted their own land they arrived after a toilsome journey on the banks of the Nile. Where by command of the goddess Padma Devi, Charma and his associates erected a pyramid in her honour. There is another migration spoken of in the Puranas, the result of a general war between the worshippers of Vishnu and Iswara, under which names water and fire were respectively typified (in Ireland Osar—Ishwara was the god who kindles fire). This is said to have commenced in India in the earliest ages, and thence to have spread over the whole world. In this struggle the Yoinjees—Earth-born—were worsted and by the direct interposition of the deity whose worship they opposed, were compelled to quit the country. These also took refuge in Egypt carrying with them the ground-work of the Egyptian scheme of mythology."—*Fraser's Magazine*, No. 237, p. 323.

The Arabs themselves call their numerals " *hindi*"—Indian. The story of the Sepoys, who prostrated themselves at the sight of the gods of Egypt, is well known. This cobra de capello with expanded hood, peculiar to India. abounds as a mortuary emblem in the tombs called Bîbân ul Muluk near Thebes, and in the temple at Dendera· " Abi, Assa, Galla, Nil, are African words derived from an Asiatic language." " The Shoan women tattoo their foreheads with a Geez letter ጠ which I am told is an ancient Egyptian symbol of the unity of the deity" Johnson's Travels. Is it not the Hindu trident-shaped Vishnu caste-mark reversed? Sembe is an African and also Indian name of a village at this day.

subsequently in the same book the young man Nilus informs Apollonius that he had heard from his father, who was captain of the ship *which the Egyptians had used to send to India*, "that the Ethiopians were Indian colonists, and retained their forefather's discipline and the memory of their ancient origin." It is noteworthy too that in Syncellus' list of the Egyptian dynasties, the 8th, 9th, 10th and 11th kings of the 18th dynasty are given as a dynasty of the Ethiopian kings *from the river Indus.* The above references show how familiar the idea of a connection between Africa and India was in antiquity, and the general belief that India was the cradle of Ethiopian and Egyptian civilization more recently, especially since the Nineveh discoveries, Assyria seems to be preferred, but as yet without the same balance of probability. Returning for a moment to Apollonius, it is mentioned in his life that he met a man who had been wandering for 7 months amongst the mountains in the country of the Gymnosophists without obtaining absolution for a murder he had committed. The man killed by him was a descendant of the Egyptian Thamus, who had formerly laid waste the country of the Gymnosophists, because they had resisted him in introducing novelties. Can this Thamus be the Tamovatsa spoken of in the Hindu legend, and supposed by Lieutenant Wilford to be the conqueror of the Manethonian King Timaus.

V.

The antiquity of the Eastern salutation salaam is shown by an epitaph of Meleager to be found at page 37 of Brunck's Analecta, Vol. I. The inscription addresses the passer-by, and concludes thus,

> If thou art a Syrian say Selom, but if a Phœnician
> Say Audonis, if a Greek χαιϱε.

In the Anthology "selom" is with great probability corrected into salam (σαλαμ), and no doubt allied with the Hebrew selah· "Audonis" is printed (with an asterisk) Naidios, but, like all punic words, is quite uncertain.

VI.

When divine Spenser sings

> "Of God's high praise, and of his sweet love's teen"

the modern reader who frequently finds the last word in the Faëry Queen and in the poetry of that epoch, on referring to the glossery,

discovers that "teen" means grief, sorrow, distress. This word, though unnoticed in Mr. Caldwell's admirable Comparative Dravidian Grammar, is identical with the Tamil தீன் teen, bearing precisely the same signification. The occurrence of the very same word in old English and old Tamil, for in both languages it is archaic, and dropt out of popular use, is something remarkable, as it is not an imitative word, and apparently referable to no common root.

IV. *The Genus Impatiens.—Description of New Species from the Anamallay Hills.* By Lieut. R. H. BEDDOME.

1. *Impatiens parvifolia.*—Herbaceous, sub-erect, branched, glabrous, leaves alternate, minute, cuneate, deeply serrated on the upper half, peduncles axillary, solitary 5-6 times longer than the leaves, with a small bract towards the apex, erect in flower, much reflexed in fruit, upper sepals small and slightly vaulted over the staminal crown, lateral ones small and pointing upwards, lower one boat-shaped without a spur, upper of compound petals, small, lower large spreading (flowers white, upper petals tinged with pink). A very curious species, with very minute leaves, it quite covers large masses of rock towards the summit of the Akka mountain at about 8000 feet elevation.

2. *Impatiens parasitica.*—Stems very succulent, often moniliform, throwing out roots, leaves crowded at the apex of stem, glabrous, long-petioled, ovate, acute, crenate, serrate with incurved bristles; peduncles axillary, short, bearing 2 (rarely 1) very long pedicels; upper sepals with a foliaceous crest, lateral ones linear, acute, lower one saccate with spur-like point; upper of compound petals much smaller than the lower one, both hid in the saccate sepal—capsule glabrous, ovate, gibbous: seeds numerous, small. On trees, from 5000 to 6500 feet; (upper sepals and petals green, saccate sepal dark red,) the flowers vary in size.

3. *Impatiens Tangàchee.*—Herbaceous, sub-procumbent, glabrous, leaves alternate, sub-verticelled, acuminated, deeply ser-

rated; peduncles axillary, 2-3 times longer than leaves, 4-8 flowered towards apex; bracts large boat-shaped: pedicels erect in flower, slightly reflexed in fruit, upper sepals large, lateral ones ovate pointed, spur long tapering, lateral of compound petals, about half the size of the lower ones, with a mucro, capsule smooth, gibbous, seeds numerous, very small (flowers pink.) In beds of streams below the Tangáchee mallay, 5500 feet.

4. *Impatiens elegans.*—Herbaceous, erect, often throwing out roots from the joints, somewhat branched; leaves alternate, on very long petioles, ovate, acuminate, crenate with incurved bristles, above a few rigid hairs on the nerves, beneath pale glabrous, peduncles axillary shorter than petiole, 3 (rarely 4-5) flowered at apex, bracts ovate-lanceolate, acuminated; upper sepals broad, ovate, flat, with a green ridge at their back; lateral ones ovate with a green ridge ending in an acumen; lower one boat-shaped without a spur; upper of compound petals very small incurved and vaulted over the staminal crown, lower ones large spreading; capsule glabrous, seeds hairy—(flowers pale rose with a dark eye) the flowers are much larger at the higher elevations at which the plant grows. Banks of streams 2500 to 4500 feet, a very elegant species.

5. *Impatiens Wightiana.*—Suffruticose, erect, branched; leaves alternate, narrow-lanceolate, acuminate, incurved, bristly serrate, above a few hairs on the nerves, below glabrous; petioles very long, with long pedicelled glands at their apex; peduncles axillary, solitary a little longer than petioles, racemed nearly their whole length; upper sepals with a green ridge at their back, lateral ones small, lower one ventricose with a short incurved spur; upper of compound petal very small, lower ones very long and narrow, pedicels in fruit horizontal, bracts small ovate. Capsule with about 5 seeds, seeds slightly hairy. (Flowers white with the upper sepals and lateral petals speckled with pink.) Banks of the Toracadoo river, 4500 feet.

6. *Impatiens ligulata.*—Erect, herbaceous, much branched, stems glabrous—leaves opposite, linear, lanceolate, mucronate, often slightly cordate at base, remotely bristle toothed, above minute harsh pubescence, below glabrous and glaucous, petioles very

short ; peduncles 1-3 axillary, about half the length of the leaves, pubescent on one side, reflexed in fruit ; upper sepals small, lateral ones linear, spur curved, gibbous, inner of compound petals ? ligulate and completely hid in the spur, lower one large spreading ; capsule glabrous, gibbous at centre containing about 12 black shining seeds—(flowers pink, stems red. There is a variety also with white flowers and colorless stems.) Teak forests 2 to 3000 feet, very abundant.

N. B.—This is a very curious species. I do not know whether to consider the long ligulate process which is entirely hid in the spur as one of the petals, or as only an appendage as in *T. viscosa* and *Anamallayensis*, vide fig. 7 and 8 ; in this species, however, there appears to be only 1 petal, so I am inclined to think that the ligulate process is the inner or lower petal, and the large spreading the lateral one ; it has quite an antheriferous look at its apex.

7. *Impatiens viscosa.*—Erect, branched, leaves opposite ovate, long petioled, with a few harsh hairs on the nerves above, pale, and glabrous beneath, incurved bristly serrate ; peduncles as long to much longer than the leaves, viscid, bearing 6-12 flowers towards the apex ; lateral sepals ovate, lower one with a curved gibbous spur (in form the same as in *ligulata*) lateral of compound petals very small, lower one large ; a ligulate process at the conjunction of the petals, which is hid in the lower sepal—capsule ovate, seeds numerous, matted with hair when immature, when ripe echinate. (Flowers small pink.) 3 to 5000 feet, generally only 5 or 6 inches high—in rich soil it is sometimes more than a foot high.

8. *Impatiens Anamallayensis.*—Erect, with sometimes small branches from the axils of the lower leaves, leaves opposite, long petioled, ovate, above a few hairs on the nerves, beneath pale, glabrous ; (leaves of the branches alternate) peduncles axillary from nearly as long to much longer than the leaves, bearing 6-8 flowers, towards the apex, on longish pedicels, lateral of the compound petals small, lower one deeply 2 lobed, a claw at the conjunction of the petals, spur very short, straight : capsule ovate, mucronate, glabrous ; seeds very hairy. (Flowers small pink.) Streams and moist places, 5 to 7000 feet.

9. *Impatiens verrucosa.*—Root bulbous, leaves radical, ovate to cordate, incurved bristly serrate, above a few hairs, below glabrous: scape 2-3 times longer than the leaves, 5-6 flowered at apex, pedicels long; upper sepals broad, vaulted over the staminal column, lateral ones small ovate; upper of compound petals large and spreading, lower deeply 2 lobed, petals with a batch of warts on their upper surface, spur nearly twice the length of flowers curved, capsule glabrous. (Flowers lilac.) Beds of streams, 7000 feet.

10. *Impatiens crenata.*—Bulbous, leaves radical, short petioled, round cordate very obtusely crenated with a bristle on each crenature, shaggy hairs on the nerves above, beneath glabrous, scape much longer than leaves, 2-3 flowered at apex, pedicels short, bracts ovate-oblong; lateral sepals small ovate, upper sepal vaulted over staminal column, margin crenated, lower sepal with a short obtuse spur, lower of compound petals deeply 2 lobed, a dense tuft of hairs on the inner surface of the petals; capsule glabrous, tapering at both ends. (Flowers white with the tuft of hairs blue.) On rocks 5000 feet—nearly allied to the next species but I think quite distinct.

11. *Impatiens Akka.*—Bulbous, leaves radical, orbicular-reniform, with cordate base, distinctly crenated, petioles longer than the leaves, scapes very long, 5-6 flowered at apex, bracts boat-shaped, lateral sepals small ovate, upper ones vaulted over the stamina, lateral of compound petals large spreading, lower deeply 2 lobed, hairy on their inner surface; lower sepal boat-shaped with a small knot-like spur, capsule oblong shining. (Flowers pure white, large.) Very abundant on rocks on the Akka mountains, 7 to 8000 feet.

12. *Impatiens tenuis.*—Bulbous, leaves radical, long petioled cordate-ovate, with lobes at the base very deep, bluntly crenated, long weak hairs on the nerves above, pale and glabrous beneath, scapes much longer than the leaves, 5-6 flowered, bracts ovate; upper sepals vaulted over the stamina; petals hairy on their inner surface, lower one deeply 2 lobed; spur short blunt and slightly bent back; capsule glabrous. (Flowers small, pink.) On rocks below falls, and in dark corners; rare, 5 to 7000 feet.

13. *Impatiens gracilis.*—Bulbous, with numerous shoots bear-

ing minute leaves; leaves radical, oval to suborbicular with cordate base, 7 nerved, glabrous; pale beneath, with very small bristly serratures, petioles very long, scape much longer than leaves, flowers numerous, long pedicelled; bracts ovate, acuminated; upper sepals vaulted over the stamina, lateral ones small; lower of compound petals broad cuneate, larger than the lateral one, entire; spur curved tapering, nearly twice the length of the flower. (Flowers large, pale lilac.) In streams, 5000 feet. This is the only one that I have met with radical leaves and an entire lower petal.

Synopsis of the Peninsular species of the Genus Impatiens.

LEAVES ALTERNATE.		LOCALITIES.
Peduncles axillary, 1 flowered.		
Lower sepal spurless.		
Pedicels and sepals covered with rusty pubescence	*I. scabriuscula.*	
Sepals glabrous, flowers minute.	*I. pendula.*	
Leaves minute, peduncles very long....................	*I. parvifolia* ..	Anamallay Hills, 8000 feet.
Lower sepal spurred.		
Suffruticose.		
Lateral sepals and spur very hairy, upper of compound petals the largest..........	*I. Munronii* ..	Neilgherry Hills, (Sisparah.)
Lobes of compound petals overlapping each other, upper sepals emarginate at their conjunction...............	*I. albida*	Courtallum, Pulney and Anamallay Hills, 4500 feet.
Petioles bearing hooked glands, upper sepals larger than petals	*I. floribunda* .	Shevagherry Hills.
Herbaceous.		
Spur hairy, double the length of petals	*I. dasysperma* .	Pulney Hills, Anamallay, Courtallum 3 to 4000 ft.

Upper sepals and capsule tomentose .... *I. Balsamina*..Plains Malabar, Anamallay, &c.

Lower of compound petals narrow cuspidate.......... *I. cuspidata* . . Neilgherries, Kota- [gherry.

Spur straight, shorter than flowers, capsule pubescent. . *I. Mysorensis*..Mysore.

Peduncles very short bearing 2 (rarely 1) long pedicels.

Lateral sepals, large pendulous....... .... *I. auriculata*...Courtallum on trees.

Lateral sepals small.

Upper of compound petals concealed under sepal...... *I. viridiflora*...

Compound petals both concealed in saccate sepal .... *I. parasitica* . . Anamallay on trees, 5 to 6000 feet.

Peduncles bearing several pedicels towards apex.

Herbaceous.

Peduncles viscid.

Spur long, tapering, flowers [feet.

large...... .... *I. viscida* .... Pulney Hills, 7000

Spur short, flowers small .... *I. Gonghii*.. . . Neilgherries (Py-

Peduncles not viscid. [carah.)

Spur ventricose, hooked .... *I. uncinata*. . . Courtallum.

Spur small, incurved........ *I. campanulata*. Pulneys and Anamallay, 4 to 7000 feet.

Spur long tapering, upper of compd. petals with a mucro. *I. Tangàchee*.. Anamallay, 5500 [feet.

Upper of compound petals very small incurved and vaulted over staminal column.

Spur longer than petals, incurved...... .... *I. cordata* .... Shevagherry Hills.

Spur none..... .... *I. elegans* .... Anamallay, 2500 to 4500 feet.

Suffruticose.
Spur very long tapering, conical, flowers very large ....*I. grandis*....Courtallum, Shevagherries 4000 ft.
Spur longer than flowers, lower of compound petals pointed downwards........*I. fruticosa*...Neilgherries (Coonoor.)
Parasitic on trees or on rocks, lower sepal saccate with spur like point................*I. Jerdoniæ*...Neilgherries (Sisparah ghat.)

Peduncles racemed nearly their whole length.
Upper sepals shorter than the lateral ones, spur long tapering..... ....*I. maculata*...Anamallay 4500, Neilgherries.
Upper sepals much larger than the lateral ones, spur with swollen point ....*I. phœnicea* . Pulnies 7000 feet.
Lower petal narrow and very long, spur very small ......*I. Wightiana*..Anamallay 4500 ft.

LEAVES OPPOSITE.

Peduncles axillary 1 flowered.
Lower sepal without a spur.
Pedicels pubescent, gibbous sepal glabrous............*I. inconspicua* .Neilgherries (Ootacamund.
Pedicels and saccate sepal villous, flowers large ....*I. rufescens* ..Neilgherries (Ootacamund.
Pedicels and saccate sepal glabrous, flowers minute ......*I. filiformis*...Anamallay 3 to 8000 feet.

Lower sepal cucullate with spur like point.
Flowers very transparent, pedicels not ½ length of leaves.*I. oppositifolia*.Anamallay 3500 to to 5000 ft. Paulghat jungles.

Flowers not transparent, pedicels the length of leaves	*I. tomentosa*	Pulneys and Anamallay 5 to 7000 feet, Neilgherries, Mysore.
Lower sepal furnished with a proper spur.		
Upper sepals minute green and hairy, 2 large glands at base of leaves, spur long	*I. Kleinii*	Anamallay 3000 ft. Malabar plains.
Upper sepals minute, spur not longer than flower	*I. diversifolia*	Malabar.
Sepals with callous points, upper petal very small, flowers large	*I. fasciculata*	Pulneys and Anamallay 5500 to 7000, Neilgherries, Malabar.
Lateral sepals long linear acute spur very short	*I. rosmarinifolia*	Courtallum.
Inner of compound petals ligulate and hid in the spur	*I. ligulata*	Anamallay 3000 ft.
Spur straight, conical shorter than flower, fructiferous pedicels horizontal	*I. tenella*	Anamallay 3000 ft.
Suffruticose leaves often subalternate, spur length of flower	*I. latifolia*	Neilgherries.
Posterior lobe of petals minute, spur longer than flower	*I. Rheedii*	
Peduncles bearing several flowers		
Peduncles viscid, flowers small.		
Spur gibbous, upper petal very small, lower one large, a ligulate process at their con-		

junction which is hid in the spur....................	*I. viscosa*....	Anamallay 3500 to 5000 feet.
Spur not gibbous, bracts gland tipped....................	*I. Pulneyensis*.	Pulneys 8000 feet.
Peduncles not viscid, flowers small.		
Lower of compound petals 2 lobed......	*I. Anamallayensis.*	Anamallay 5000 to 8000 feet.
LEAVES VERTICELLED.		
Peduncles axillary, 1 flowered, leaves 3 in a whorl........	*I. Gardneriana.*	Neilgherries (Sisparah ghat 4000 ft.)
Peduncles with several flowers, leaves 4-6 in a whorl ..	*I. verticellata*..	Anamallay & Shevagherries 3 to 4000 feet.
LEAVES RADICAL.—Inflorescence a scape.		
Lower of compound petals, 2 lobed.		
Spur long curved.		
Spur twice length of petals, petals smooth....	*I. rivalis*......	Anamallay 3000 ft. Courtallum.
Spur longer than petals, petals with warts on upper surface.	*I. verrucosa* ..	Anamallay 5 to 7000 feet.
SPUR SHORT.		
Petals hairy on their inner surface.		
Upper sepals crenated, flowers rather large..............	*I. crenata*....	Anamallay 5000 ft.
Upper sepals entire, flowers large......	*I. Akka*.....	Anamallay 7000—8000 feet.

Upper sepals entire, flowers very small..................	*I. tenuis*......	Anamallay 5 to 7000 feet.
Petals not hairy.		
Leaves glabrous; cordate, lobes overlapping..............	*I. scapiflora* ..	Neilgherries 7 to 8000 feet.
Leaves hairy above cordate...	*I. modesta*....	Neilgherries (Pycarah) Shevagherries.
Lower of compound petals entire.		
Spur long incurved twice the length of petals..........	*I. gracilis*....	Anamallay 5000 ft.

NOTE.—The Diagrams representing flowers dissected will appear in the next number.—ED. MAD. JOUR.

V. *Numismatic Gleanings. By* WALTER ELLIOT, *Madras Civil Service.*

No. 2.

THE next description of coin to be noticed, is of a very remarkable character and has been found only in one locality.

On the north bank of the Rushikuliya river, in the province of Ganjam, about four miles to the west of Purushòttapúr, the kasba town of the Pubakonda talúk, and close to the modern village of Pândya are the remains of an extensive but now deserted town, surrounded by the debris of a lofty wall. The spot is indicated in sheet 107 of the Indian Atlas by a quadrangular dotted outline, representing a square fortification with a bastion at each angle. This in fact, is very much the appearance of the place. The remains of the rampart can be traced continuously round the whole enceinte, forming nearly a perfect square with a gateway in the centre of each face. The grassy mounds indicating the line of the ramparts, are now covered in many places with jungle, but in others are quite clear. About the middle of the enclosure rises a group of granite rocks, on the face of one of which, at a consi-

derable height from the ground, are two smoothed tablets, filled with inscriptions in the characters of the Allahbad and other similar columns.* They will proably be found to contain another and hitherto unnoticed copy of Asokas edicts,† corresponding apparently with those at Girnâr in Kàt'hiyawàr, at Dhauli in Cuttack and at Kapardagiri beyond the Indus.‡ The placc is now known by the name of Jògad'h, signifying in the Uyra dialect "Lac-fort," a circumstance which has given rise to a local tradition, that the lofty walls formed of that material were impregnable, until the secret of their construction was betrayed by a milk-maid which enabled the besiegers, by the application of fire, to effect an entrance.

In the neighbourhood of this place numbers of copper coins are found, of a type different from any other hitherto met with in Southern India, but presenting a striking resemblance to those of the Indo-Scythian group, more especially to the coins of Kanerki.§ All are much worn, but the following wood cut represents one of the most perfect.

The figure on the obverse and reverse is the same, but in the cut, the position of the arms has been reversed, the right hand being represented down, and the left up, whereas it is the right which should be raised, and the left down.

No traces of Scythian domination have hitherto been met with so far to the south, but it is hardly possible to look at the design in the above figure and not to identify it with those im-

* Jour. As. Soc. Beng. III. pp. 114—483.

† Of these the most celebrated is that of the Allahbad column, first deciphered by James Prinsep, who found it to be identical with those on the pillar called Firoz Shah's *lat'h* at Delhi and on the columns at Bettiah, Rad'hia, &c., in North Behar. The rock inscriptions at Girnar, &c., subsequently deciphered, also proved to be repetitions of another set of edicts by the same monarch.

‡ J. A. S. B. VII. 156, 219, 434.

§ Wilson Ariana Antiqua, pp. 365, 368. Pls. XI, XII.

pressed on the money of that race. James Prinsep has ingeniously traced the gradual transitions of Indian money from Greek models, through the ruder mintage of the Indo-Scythian dynasties, to the purely Hindu coinage of the Gupta kings. Throughout this series, an Indian character is unmistakeably impressed on the progressive adaptations of the mixed Indo-Scythic designs to a pure Hindu type. But no such features can be detected in the Jògaḍ'h coins. On the contrary they have all the appearance of being degraded repetitions of the original Tartar figure, without symbol or legend or other adjunct.

Occasional notices in the writings of Greek and Chinese authors, supported by the numismatic researches of Prinsep, Lassen, Wilson, Cunningham and others, have made us acquainted with the facts of two great invasions of the countries bordering the Indus, by people of Scythian race, about the period of the Christian æra.*

The first was that of the *'Sakas* or *Sacæ*, one branch of whom under Kadaphes, overthrew the Græco-Bactrian power in Affghanistan and other parties extending their possessions towards the south, occupied Scinde and the countries of the lower Indus, under Mayes and his successors, Azes and Azilisus. Encouraged by these successes, they appear to have meditated the conquest of all India, but their progress was checked by Vikramàditya, the Hindu King of Malwa, who gave them a signal overthrow B. C. 56, and assuming the title of *'Sakàri*, established the æra which still bears his name. About the same time, a second influx of a horde called by the Chinese authorities (to whom we are indebted for almost all that is known of their origin,) *Yu-chi* or *Yu-ti*, driven from their original seats in Tartary, poured into the countries south of the Paropamisus, and took possession of the whole country, from Herat to the Bay of Bengal. The coins of Kadphises called Kadphises Koranos, to distinguish him from Kadaphes the first conqueror of Cabul and those of Kanerki his successor, have been found throughout the whole of upper India. Their occurrence is not unknown even in the south, two or three

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* Lassen in J. A. S. B. IX. pp. 667, 742, 755, 760, 765. Wilson Ar. Ant p. 302. Cunningham, Bhilsa topes, ch. XI.

specimens in copper having been obtained from Masulipatam and one from Tanjore.

According to Chinese authorities, the *Yuchi* (who appear to be the same as the people called *Tochari* by the Greeks,) retained their hold on India, certainly till A. D. 222* and probably for some time longer. But their power appears to have been then on the wane. There is nothing improbable therefore in the circumstance of some adventurer having penetrated either through Gondwàna or Cuttack to the site of Jògaḍ'h and there having established a petty principality, such as is indicated by the coins under notice. The secluded nature of the country, cut off from intercourse with the interior by the pestilential jungles of Khondistan, the Kôlhàna and Gondwana, is particularly favorable to the continued existence of a small independent state, which in such a situation might long have eluded the observation and cupidity of more powerful neighbours.

Whether the grounds slender as they are, on which a Scythian origin is attributed to these coins, be sufficient, it is for others to say. Should they fail to be accepted, I am unable to indicate any other class of Indian money to which they can be assigned.

The Boar Type.

Among the objects employed as distinguishing symbols on the coins of the south, by far the most celebrated is that of the Boar. Originally the badge of the Chàḷukya families of Kalyàṇ and Ràjahmahéndri, it passed from them to the later Chólas, was subsequently adopted by the Ràyar dynasty of Bijanagar, and is still found on the seals of some of the petty local chiefs in the Carnatic.

Previous to the arrival of the first Chàlukya in the Dak'han, the Pallavas were the dominant race. In the reign of Trilochana Pallava an invading army headed by Jaya Sinha, surnamed Vijayàditya of the Chàlukya-kula, crossed the Nerbudda, but failed to secure a permanent footing. Jaya Sinha seems to have lost his life in the attempt, for his queen then pregnant, is described as flying after his death, and taking refuge with a Brahmin called Vishnu Sómayàji, in whose house she gave birth to a son named

* J. A. S. B. VI. p. 63.

Ràja Sinha, who subsequently assumed the titles of Raṇa-ràga and Vishnu Vard'hana. On attaining to man's estate, he renewed the contest with the Pallavas, in which he was finally successful, cementing his power by a marriage with a princess of that race, and transmitting the kingdom thus founded, to his posterity. His son and successor was named Pulakési, and his son was Vijayàditya II. A copper *'sásanam* recording a grant made by Pulakési which bears date S. S. 411 or A. D. 489, is extant in the British Museum. The next prince was Kirtti Varma who left two sons, the elder of whom Satyà'sraya succeeded him in the kingdom of Kuntala désa, the capital of which was Kalyàṇ, a city still existing under the same name, about 100 miles west and a little north of Hydrabad, while the younger, Kubja Vishnu Vard'hana or Vishnu Vardhana the Little,* established a new seat for himself in Telingana by the conquest of Vengipuram, the capital of the Vengi désam, which comprised the districts between the Godavery and the Kistna below the ghats. This event appears to have taken place about the end of the sixth or beginning of the seventh century.

The two families ruled over the whole of the table-land between the Nerbudda and the Krishna, together with the coast of the Bay of Bengal from Ganjam to Nellore, for about five centuries.† The power of the Kalyàṇ dynasty was subverted for a time in the end of the 9th or beginning of the 10th century, and the emigrant prince or his son, succeeded by marriage in A. D. 931 to the throne of Anhalwàra Pattan in Guzerat, which his descendants occupied with great glory till A. D. 1145.‡ But in A. D. 973 the dynasty of Kalyàṇ was restored in the person of Tailapa Déva and ruled with greater splendour than before till its extinction in A. D. 1189 by Bijjala Déva, the founder of the Kalab'huriya dynasty.§

The junior branch extended their territories northwards from Vengi to the frontiers of Cuttack, and ultimately fixed their capi-

* The word *Kubja* properly signifies "crooked" or "hunch-backed."

† Dating from the first conquest of Ràja Sinha the whole period would be seven centuries, but there is some chronological obscurity about the earlier princes of the series which we hope to clear up hereafter.

‡ Tod Ann. Rajasthan, where the Anhalwara family is styled both Sòlaṇki and Chàlukya, pp. 80 and 97.

§ Jouṛ. R. As. Soc. IV. p. 17; and Mad. Jour. Lit. and Sc. VII. p. 209.

tal at Ràjamahéndri the modern Rajahmundry. More than one revolution appears to have occurred in the course of their history, but the old family always contrived to regain its power, until the kingdom passed by marriage to Ràjéndra Chóla the then dominant sovereign of southern India, in whose person the power of the Chólas had reached its zenith. Whether the acquisition of Telingana was due entirely to inheritance or to the joint influence of force cemented by matrimonial alliance, is not clear. The fact however, is certain, that the Chóla power was established in the eastern Chàlukya territories for upwards of a century and a half, and has left permanent traces of its existence. Ràjéndra Chóla was succeeded by his son Vikrama Déva surnamed Kulòttunga Chóla. On the death of his uncle Vijayàditya who had been viceroy of Vengi-désam, the king deputed his son Ràja Ràja to assume the office, but after holding it for one year, A. D. 1078, he resigned it in favor of his younger brother Vìra Déva Chóla, who assumed the title of Kulòttunga Chóla. His grants are found in great numbers from A. D. 1079 up to the year 1135 when a partial restoration of the Chàlukya line appears to have taken place, and they maintained a divided and feeble influence till the latter part of the 12th century when the country fell under the sway of the Kakatiya dynasty of Warangal.*

To assist future enquiries in assigning the coins of the Chálukya race to their proper authors, a list of the sovereigns of both branches is subjoined.

1. Jàya Sinha, Vijayàditya.
2. Ràja Sinha, Rana Ràga, Vishnu Vard'hana.
3. Vijayàditya II.
4. Pulakési, A. D. 489.
5. Kìrtti Varma I.
6. Mangalìsa.

Kirtti Varma I. had two sons of whom the former Satyà'sraya succeeded his father and uncle (who seems for a time to have usurped his rights) as the representative of the Kalyán branch, and from him that line has been called the Satyà'sraya kula, while

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* The earliest inscription of the Kakatiyas that has been met in Vengidésan now the Northern Circars, bears date A. D. 1175 ; the latest 1336.

the latter Vishnu Vard'hana the Little *(Kubja)* was the founder of the Rajahmundry dynasty.

WESTERN LINE.

7. Satyà'sraya began to reign A. D. 609.
8. Amara.
9. Aditya.
10. Vikramàditya I.
11. Vinayàditya, Yuddha Malla began to reign A. D. 680.
12. Vijayàditya III. do. A. D. 695.
13. Vikramàditya II. do. A. D. 733.
14. Kìrtti Varma II.
15. Kìrtti Varma III. cousin of the last A. D. 799.
16. Tailapa.
17. Bhìma Ràja.
18. Ayya or Kìrtti Varma IV.
19. Vijayàditya IV.
20. Taila Bhùpa II. or Vikramàditya III. in A. D. 973, restored the monarchy which had been for some time usurped by the Ratta kula. He died A. D. 997.
21. Satyàsraya II. Irivi Bhujànga Déva, A. D. 997.
22. Vikramàditya V. began to reign about A. D. 1008 ?
23. Jaya Sinha Déva, Jagadéka Malla, about A. D. 1018 ?
24. Sòméswara Déva I. Treilòkya Malla, 'Ahawa Malla, about A. D. 1040 ?
25. Sòméswara Déva II. Bhùneka Malla, A. D. 1099, expelled by his brother,
26. Vikramàditya VI. Kàli Vikrama, Tribhùvana Malla, in A. D. 1076.
27. Sòméswara Déva III., Bhùlòka Malla, A. D. 1127·
28. Jagadéka Malla, A. D. 1138.
29. Tailapa Déva III., Treilókya Malla, A. D. 1150.
30. Sòméswara Déva IV., Tribhuvana Malla, A. D. 1182. Dethroned by Bijjala Déva of the Kalab'huriya kula.

EASTERN LINE.

1. Vishnu Vard'hana II. or Kubja Vishnu Vard'hana, conquered Vengi A. D. 605.

2. Jaya Sinha I.
3. Indra Ràja his brother.
4. Vishnu Vard'hana III.
5. Manga Yuva Raja.

Brothers {
6. Jaya Sinha III.
7. Kokkili.
8. Vishnu Vard'hana IV.
}

9. Vijayàditya I.
10. Vishnu Vard'hana V.
11. Narèndra Mriga Ràja.
12. Vishnu Vard'hana VI. or Kàli Vishnu Vard'hana.
13. Vijayàditya II. or Guna-gunànka Vijayàditya conquered Kalinga.
14. Chàlukya Bhìma I. his brother.
15. Vijayàditya III. or Kollàbhiganda Vijaya.
16. Amma Ràja,
17. Vijayàditya IV. or Kandagachita Vijaya.
18. Tàlapa—Usurper.
19. Vikramàditya V. the son of a brother of Amma Raja I.
20. Yudd'ha Malla.*
21. Ràja Bhìma II.
22. Amma Raja II.
23. D'hanàrnava. Interregnum of 27 years.
24. Kirtti Varma, son of D'hanàrnava.
25. Vimalàditya, his brother.
26. Ràja Ràja Narèndra.
27. Ràjèndra Chóla.
28. Vikrama Déva Kulóttunga Chóla.
29. Ràja Ràja Chòla, viceroy for one year.
30. Vìra Déva Kulòttunga Chòla or Saptama Vishnu Vard'hana. Viceroy from A. D. 1079 to 1135.

The Chàlukyas were of Lunar race and apparently worshippers of Vishnu. The fact of Ràja Sinha having been educated by

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* Some accounts make Yudd'ha Malla the son and successor of Tàlapa and expelled by Vikramaditya V.

Vishnu Bhatta Sòmayàji, a Vaishnava Bramin, probably tended to confirm the attachment of the family to this creed. Their style and titles are as follows: Chàlukya kula; Mànavyasa gòtra; Hàriti-putra; whose royal power was the gift of Kousika; nourished by the seven mothers; worshipping Swàmi Mahàsêna; having the Boar signet (lánch'hana) the gift of Bhagavàn Naràyana. The insignia of royalty are elsewhere described as consisting of

The white canopy.	'Swêtàtapatra.
The conch shell.	'Sankha.
The noubat.	Pancha mahà-'sabda.
The plough ensign.	Halakêtana.
The drum.	D'hakka.
The Boar signet.	Varàha lànch'hana.
The peacock fan.	Mayùra pinch'ha.
The spear or mace.	Kunta.
The throne.	Sinhàsana.
The royal arch.	Makara-tòranam.
The golden sceptre.	Kanaka dandam.

But in the inscriptions recorded when they were at the height of their power, the white canopy, the boar signet, the peacock fan, the royal mace and the golden sceptre only are mentioned. Of these the boar ensign was the most celebrated, and was the symbol invariably represented on their money and on their seals, sometimes in the latter, accompanied by the conch-shell, the drum, the peacock-fan and other insignia not enumerated above, as a lotus, an *ankus* or elephant-goad, candelebra, a seat or stool? the *swastika* cross, &c., and on those of later date—a sword.*

Considering the extent and long duration of their power it is extraordinary that their coins are not more frequently met with. Those represented in plate 1 contain the whole that have fallen in my way, during the twenty-five years that I have been enquiring for them. I have, however, heard of several specimens which have not come under my own eye. A remarkable hoard of gold pieces bearing the effigy of a Boar was discovered many years ago.

* It is not clear whether the sword was ever assumed by the true Chàlukyas or only adopted by a succeeding dynasty.

in Bellary, the contents of which were presented by Mr. E. B. Glass, the Sub Collector, in whose division they were found to the Revd. Mr. Lowry of the Scottish Church, and by him carried to Scotland. Some others are said to have been taken from a well in the Hatghar zemindarry in Ganjam and coming into the possession of the proprietor, were lost or melted up.

From the practice of stamping the figure of the Boar or *varáha* on the Chàḷukya coins, the coins themselves came to be distinguished as *varáha mudra* or "boar stamped" and the word *varaha* or *varágan* to be the vernacular term universally applied to the characteristic gold coin of Southern India, to which Europeans gave the name of pagoda.

But as a gold coin of the same value was probably in circulation long before the Chàḷukya symbol attained such general celebrity, so the term *varaha* is found to have superseded other names of more ancient date. In Telegu the abbreviated form of expressing this coin in writing is by the letter *g.* (గ) as గ ౧ which is invariably read " one varaha" or pagoda. This has doubtless come from *gad'hyánam* a word of Sanscrit origin not in Brown's Dictionary, but of constant occurrence in inscriptions of all ages.

In like manner the Canarese mode of writing the word *varaha* is by the letter *gu* ಗು the first syllable of *gulige* ಗುಳಿಗೆ a small globe or ball (equivalent to the Sans. *gutika*, " pilulus") which was the ancient name of the small spherical coins described in No. 1.

In Tamil, the oldest and apparently the root of all the Dravida dialects, the word *varáha* is now expressed in ordinary writing by the sign உர the first syllable of the word *varágan*.

But this is a modern practice. The word *varaha* never occurs in old writings. To the best of my recollection I have not met with it in any of the numerous ancient Tamil inscriptions which I have collected from all parts of the peninsula.

Whenever a sum of money is mentioned in these ancient records, the denomination in which it is expressed is *pon*, a genuine Tamil word, the normal signification of which is " gold." Even now this word is occasionally used in the sense of a pagoda, in social

ceremonies and time-honored observances, indicative of ancient origin. For instance, the dowry in Tamil marriages is regulated according to fixed scale, with reference to the standing of the several castes, those of highest rank being rated lowest, and the amount of such dower is invariably reckoned by *pons*. Thus the sum appointed for a maiden of Vellazhar race, the first in rank of the Tamulian castes, was formerly 11 and is now 21 *pons*, which in every day usage are represented by 73½ rupees.

In addition to the dowry the bridegroom's parents are required to give another *pon* tied up in a piece of cloth, under the name of *mulei-pál-mudichi* or *mulei-pál-kúli** "the price of the mother's milk," typifying that the expenses of the bride's rearing are thereby discharged, and that she has become thenceforth the purchased property of her husband.

In place of this *pon* it is now the practice to present 3½ rupees wrapped in cloth, to the girl's mother.

The proverbial expression ஆனைகறுத்தும்ஆயிரம்பொன் "though the elephant is black, it is worth 1000 *pons*," conveys the same sense.†

Nor is the evidence confined to colloquial instances. The same use of the word is found in the oldest standard compositions. In the Harischandra purànam when the minister sells his prince to a *Puliya* or out-cast, the price set upon him is 10,000 *pons*..

These examples show that although superseded in modern Tamil by the word *varágan*, the term *pon* was anciently used in the same sense. And this is still more apparent in the southern provinces. In Tanjore the revenue accounts up to a comparatively recent period were kept in *pons*, *panams* and *kásus*, and these terms are still employed in estimating the value of land. But the modern value of the *pon* of account, is only 1 rupee 9 annas. It could never therefore have represented the modern pagoda, the

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* முலைப்பால்முடிச்சி or முலைப்பால்க்கூலி, lit. "breast-milk-packet" or "breast-milk-hire."

† The Nàṭṭu Kòṭṭei Cheṭṭis a race of mercantile Vellazhas from Tinnevelly, who trade extensively along the whole length of the Coromandel Coast, and the Labbis frequently employ the term *pon* when speaking of pagodas.

oldest specimens of which weigh upwards of 50 grains, and judging from its present nominal value the ancient *pon* could not have weighed more than 20 to 25 grains.

The inference I draw from this fact, is, that the normal standard coin was a piece equal to the modern half pagoda, the pagoda itself being the double *pon*, which ultimately became the *varaha.*

This view is strengthened by the similarity of terms in the Canarese language, in which the following denominations of the present coinage are found:

2 gunjas=1 dugala.
2 dugalas or 4 gunjas=1 chavala or chavile.*
2 chavalas or 8 gunjas=1 d'harana.
2 d'haranas or 16 gunjas=1 honna.
2 honnas or 32 gunjas=1 varaha.

Here the word *honna* is the exact equivalent of *pon*, the *p* in the Hala Kannada dialect being always replaced by *h*, in the modern dialect.

It appears, therefore, that a similar confusion must have taken place, between the *honna* and *varaha* of the Canarese, as has been shown to exist between the *pon* and *varágan* of the Tamils, hence the Mohammedans who first came in contact with the Canarese people in their progress from the north, adopted the word *hún* (هون) as the Dak'hani term for the standard coin of the country.

The star pagoda is stated by Kelly to weigh grs. 52·56, but on turning to the list of gold coins at p. 39 of Prinsep's Useful Tables, the weights of several of the modern pagodas, will be seen, (excluding those struck at Mohammedan and British mints), to vary from grs. 50 to 52·8. Examples of the older Hindu pagodas now extant exhibit a still greater degree of variation. This may proceed either from the rudeness of the process pursued in the earlier mints,—or from the carelessness of the workmen and their indifference to accuracy,—or it may be due to changes or depreciation of the standard, arising from the caprice or the necessities of the sovereign.

* The same terms are also found in Telugu, with the exception of *honna* which is replaced by *máda*. *Chavala* is also sometimes written *chavile.—Br. Dict.* 319-20.

The average weight of twelve of the oldest specimens of the *varaha* and its prototypes in my cabinet, and ranging from grs. 53·27 to grs. 66·9, is grs. 58·05. Discarding the fraction, the weight of the *pun*, *honna*, or *pratápa* as it is also called and *máda*, the equivalent term in Telugu, would then be grs. 29.

The *d'hárana*	14.5*
chavala	7·25
dugala	3·625·
béda (which is the Telugu name of the coin representing the *gunja* or *rati*)	1·8125

These results tally approximately with some of the smaller specimens in my collection. Two small pieces from Tanjore, belonging to the Chòla series, to be described in No. III., which I suppose to be *chavalas*, weigh grs. 7·6 and 7·65 respectively, and a third struck by a Pandyan prince, grs. 7·225. Two still smaller and therefore assumed to be *dugalas*, also from Tanjore and apparently belonging likewise to the Chòla series, weigh grs. 3·525 and 3·45. But on the other hand the gold fanams described in No. I.† though of equal or perhaps higher antiquity, do not exceed grs. 6·8 and some are as low as grs. 5·45, and the smaller ones grs. 3, whilst those figured in Pl. 1 with the present No. are a trifle short of 7 grs.

There is no doubt that the earliest coins were merely representatives of pre-existing weights in use at the time when a stamped currency was introduced. The foundation of most of these systems was the *gunja* or *raktika* or more commonly *rati*, the seed of a plant‡ growing in every part of India. It is still in general use among native goldsmiths and varies considerably in size and weight. The discrepancies in the weights of the early coins that have come down to us may be owing, in some de-

* This it will be observed is nearly the weight of the mâsha which, derived from a seed of *Phaseolus radiatus*, serves as one of the *units* of Indian metrology. Jervis (1829) followed by Prinsep (1834) assumes the goldsmiths or bullion *másh* to be grs. 15·5 and from it deduces the proportions of all the other denominations of the system, according to which the *gunja* or *rati* will be grs. 1 9375, the *chavile* 7·75 and the *varaha* 62. Jervis, weights of Konkan, p. 40; Pr. U. T. p. 17.

† Vol III. p. 236-7.

‡ *Abrus precatorius.*

gree to this cause. For it is notorious that goldsmiths use one set of seeds for buying and another for selling,* and it is quite possible that mint-masters may have availed themselves of a similar license in receiving bullion and issuing coin.

An examination of the old system of weights prevalent in Southern India will probably throw more light on this part of the subject, to which it is proposed to return in a subsequent No.

Description of Plate I.

Figs. 1, 2, are of gold and belong to the same class as those described in the former No. figs. 28 to 35, the symbols consisting of a normal figure in the centre, around which four or five others have been afterwards struck by means of smaller dies or punches.

Fig. 1. Cup-shaped, with the reverse plain; obverse on the concave side, with a rude figure of a boar for the normal or central figure, around which are four circular stamps of the *chakra* or wheel. Between these, immediately in front, and in rear of the boar, two stamps of what has been supposed to be intended for the character శ్రీ, *sri* and above and below the boar two square stamps containing letters of which the letter ಜ *j* only is well defined. The piece weighs grains 55·75.

Fig. 2. is also cup-shaped. The obverse has in the centre a boar much better defined than in the preceding specimen and the design altogether exhibits a superior degree of execution. Above the principal figure are separate stamps of a *padma* or lotus and a *'sankh* shell, below is a bow and before and behind the *'sri*-like symbol. Reverse, a few lines at right angles to each other, forming an irrgular square. Weight grains 58·65.

Both of these were procured from Kurnool. They exhibit a direct transition from the earlier Buddhist coins to those of the first Chálukya princes, and may be considered as examples of the earliest money struck by that dynasty. These two are the only specimens I have ever met wi'h, but in 1846, Capt. Latter, in a paper on the symbolical coins of Arracan, in the Calcutta Journal, described a third, which he states to have been found on the sea-shore

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* Jervis' weights of Konkan, p. 39.

in the island of Ramree. "The central portion" he observes, "represents an animal like a pig, with the representation of the sacred Bo-tree above and a monographic character ꩜ beneath, and around, certain characters, &c."* The coin so characterized is doubtless an early Chál̤ukya *gad'hyánam* and its presence in Ramree is easily accounted for by the commercial intercourse which has at all times subsisted between the coast of Kalinga, long under Chál̤ukya domination, and the opposite country of Arracan. Judging from Capt. Latter's figure which is rudely depicted, the central figure is clearly that of a boar, surmounted by a *ch'hatra* or umbrella and with a pillar *(stamb'ha)* or candelabrum before it. The monagram is perhaps the *'sank'h* or some other of the symbols represented on the seals in plate II, and round the central figure are seven separate stamps, four and probably all of which, represent letters in the Hala-Kannada *or* old Telugu character.

Figs. 3, 4, and 5 are all gold die-coins, and may therefore be assumed to belong to a later series. The form also is different and more nearly approaches to the common dumpy form of the pagoda in modern times, but they exceed the heaviest of the recent pagodas in weight. They may be assigned to the period between the 7th and 10th centuries, their relative antiquity being in the inverse order to their numbers in the plate.

Fig. 3, is a copy of fig. 13 in plate 104 of Moore's Hindu Pantheon containing representations of coins found in the cabinet of the late Tippoo Sultan; the obverse represents the boar with the sun, moon, a cross probably intended for a sword and some other symbols not recognizable; the reverse has the scroll pattern, characteristic of many of this class of early coins, from which the term *p'húli hún* or flower-pagoda has probably been derived.

Fig. 4. Obverse, a boar caparisoned with jewelled trappings and having three scrolls of foliage above and below; reverse, a radiated *chakra* or wheel; weight grains 58·65. In the collection of the Government Central Museum, for which it was purchased at the Exhibition of 1855, from the objects transmitted by the Bellary Local Committee.

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* Jour. As. Soc., Beng. Vol, xv. p. 240. Pl. iii. fig. 6.

Fig. 5. Obverse, a boar with the sun and moon above ; reverse, a *chakra* or wheel. This is more rudely executed than the last. The symbols on the reverse of both exhibit indications of Buddhist influence.

Figs. 6 to 10, appear to be gold *chavalas* and form part of a considerable hoard which was discovered in a nullah at the village of Revada in Vizagapatam in 1853, accompanied by some of smaller size and by several others with the figures of fish, and of a fish and panther, symbols of the Páṇḍyan princes and of a bull couchant. From this, I conclude, that they must have been deposited subsequent to the union of the Cháḷukya with the Chóḷa race when the latter having swallowed up most of its rivals to the north and south, had absorbed both the Páṇḍyan and Cháḷukyan territories, in the 11th century.

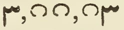
The design on all these is nearly the same ; obverse, a boar over which is an *anku'sa* or elephant-goad ; reverse, the letter with the numerals  or 3, 11, 13, respectively, referring probably to the year of the king's reign in which they were struck. The letter appears to be an old Telugu or Canarese form of *s* and might be supposed to refer to the initial of the reigning sovereign's name, but it is found also on the Páṇḍyan pieces discovered at the same time. The two heaviest weigh grains 6·95. Two very much smaller pieces forming part of the same deposit and weighing grains 1·35 and 1·5 are probably *dugalas.* The smallest has a boar in form exactly resembling the rude outline in the centre of fig. 1. The reverse is indistinct but appears to contain a Nagari letter. The other is a miniature copy in all respects of the *chavalas* above described, with a similar reverse, viz : the character *s* and the numerals 11.

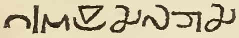
Fig. 11. A copper coin ; obverse, a boar, above which are a sword and the sun : reverse a legend in old Telugu or Canarese characters  in three lines, the upper one of which appears to contain the Telugu figures 15 and the two following ones may be read *'Sriman Rúma.* Weight 57 grains.

Fig. 12 to 17. Five copper coins all of similar design. Obverse, a boar with a sword and the sun and Nagari legends on the reverse. The letters are in horizontal lines on 12, 13, 16, but in vertical lines on 17. Most of these are much worn and very indistinct but the plainest 12 and 13, appear to read *Sàlava* or *Chálava Tiramal Ràya.*

But no such name occurs in the lists, and it cannot refer to the *kula dévata* or household god of the king, for in that case the word *déva* would have been substituted for *ráya*. A king of this name is found in the Bijanagar dynasty between A. D. 1564 and 1572. The princes of this race which as will be shown presently, adopted the boar ensign, always used the Nagari character in their inscriptions and the letters on these coins are of a comparatively modern form. The addition of the sword further favors this supposition. But if this symbol is to be taken as exclusively characteristic of the Ráyars, it will be necessary to assign fig. 11 to them also, which is certainly of greater antiquity and presents other marked discrepancies besides. Their weights are grains 53·275, 43·3, 55·05, 44·95 and 43·8.

Fig. 18. A copper coin much defaced. Obverse, a boar standing in front of a pillar, the rest too indistinct to be clearly made out. Reverse, a legend in Tamil also illegible. This has much the aspect of a Páṇḍyan coin. See fig. 26. Weight, 60 grains.

Figs. 19 and 20 are two copper coins both belonging to the same prince. Obverse of 19, a boar, with an imperfect Tamil legend ; reverse, a rudely represented sitting figure, such as is found on the numerous class of southern coins first brought to notice by Prinsep in his " Ceylon series," and with the Nagari letters under the arm *Sri Rája Rája* ; weight grs. 52·225. The obverse of fig. 20 exhibits also a boar, which is ornamented somewhat in the style of that in fig. 4 and stands on a support like that in the seals in plate II. Reverse, the same sitting figure as in fig. 19, with the name *Rája Ràja* under the arm. This coin is in the collection of Col. Frederick Clerk, late of the 3rd or C. L. I. Regt. They were probably struck by Rája Rája Narèndra the 26th prince in the eastern line, or by his great-grand-son, the 29th, who after his resignation of the vice

royalty of the Telugu portion of his father's kingdom reigned at the seat of the Chóla power in the south, where these coins are chiefly found, Nos. 12 to 21 having all been procured from Tanjore and South Arcot.

Fig. 21. Copper. Obverse, a boar as in fig. 20, with a pillar or lamp in front, an umbrella above, and a scroll underneath. Reverse, the rude standing figure characteristic of the southern or Ceylon type of coins, with four balls and a *'sank'h* shell under the left arm. This reverse, peculiar to the coins of the south, stamps it as belonging to a Chóla-Chálukya prince but to which of them, in the absence of name or characteristic symbol, it is impossible to determine. Weight grains 44·75.

Figs. 22, 23, 24 and 25 are very rude copper coins. All have the boar on the obverse, the first with the addition of a sword. The reverse of 22 is imperfect and appears to be a scroll. That of 23 has a cross round which are drawn two circles. On 24 is a *sinha* or lion, connecting the boar type with that represented in Plate ix of No. 1. The reverse of 25 has some resemblance to the symbol on fig. 1.

They weigh grains 32·25, 25·23, 55 and 33·125.

Figs. 26, 27, 28, 29, 30 and 31, all of copper, constitute a new class pertaining to a dynasty unconnected either with the Chálukya or Chálukya-Chóla families. All have the boar obverse, pertaining to these families, but the legends on the reverse are in Tamil characters.

Fig. 26. Is the most typical and characteristic of the series and supplies data for assigning a place to the others. The obverse has the two fish and crozier of the Pandyán kings and altho' the letters are almost obliterated—on a comparison with others of the same prince, they can be identified as giving the name சுந்தரபாண்டியன் *Sundara Pándiyan* one of the later sovereigns of that dynasty, who appears to have vanquished the Chólas shortly before their final extinction. His grants are extant throughout the whole of the Tamil country. We find several of them occurring at Conjevaram,

and one or two even as far north as Nellore. From these facts, coupled with the discovery of the coins, under consideration, it may be concluded that he assumed the insignia of his vanquished foe and struck coins bearing the dominant symbol of the age.

The remaining three figures represent seals, on rings uniting plates of copper, on which are engraved grants conferred by the earliest princes of the Western Chálukya dynasty.

Fig. 32. Is the seal on a grant of Satyá'sraya the seventh in the list. It bears date S. S. 534 corresponding with A. D., 612.

Fig. 33. Pertains to a grant by Vikramáditya Satyá'sraya or Vikramáditya I. the tenth in the list and the great grandson of the above. The originals of both these grants are in possession of Mahéndra 'Sánti a Jaina Guru at Hyderabad and were sent to me for inspection by General Fraser when resident at the court of the Nizam.

Fig. 33. Is the seal on a grant made by Vinayáditya Satyá'sraya the son of Vikramáditya I, with the date S. S. 613. (A. D. 691.) It belongs to a person in the Kurnool district. I was enabled to copy it through the kindness of the late Capt. Newbold, Asst. Commissioner.

Plate II. The first three figures in plate II. represent seals of the Eastern Chálukyas.

Fig. 1. Represents a seal on a grant, engraved on 4 plates, of certain villages conferred on Brahmins by one Ambod'hi Rája under sanction of Vishnu Vardhana in S. S. 974 or A. D. 1052. The term employed to designate the king is the generic one, which though specially assumed by certain princes of the dynasty, seems to have been more or less common to all and may perhaps refer in this instance to Rája Rája Narèndra, the son of Vimalàditya, and son-in-law of Rajéndra Chòla.

The seal contains in the centre the words '*Sri Tribhuvan anku'sa,* which may be rendered " the auspicious elephant-goad of the three worlds," implying that the owner of the seal controlled the universe as the *ankus* restrains an elephant.

Above the legend is the figure of a boar, with a chank shell and

chàmara in front, and the small drum called *damara* with another *chàmara* behind.

Above these are the sun and moon and a *ch'hatra* which the artist has erroneously represented in the form of a cross or quatre foil.

Below the legend is an expanded lotus and below it a bud on its stalk, a small table to the right, and an *ankus* to the left.

Figs. 2 and 3 are on grants made by Virá Déva Chóla surnamed Kulóttunga Chòla, Tribhuvana Chakravartti and Saptama or seventh Vishnu Vard'hana who was appointed viceroy over the Chálukya dominions by his father Vikrama Chòla and ruled them for nearly sixty years.

Fig. 3 is the earliest in point of date, it records the grant in S. S. 1001* of a village called Kaléru in the Rajahmundry district to a Brahmin named Médam 'Arya, as an endowment for the maintenance of two *mantapams* erected by him at Pithápur and Draksharámam and of a tank constructed at an *agrahàram* called Chellùr. In the centre of the seal, is inscribed in ancient characters the title *'Sri-Tribhuvan anku'sa*, above which is the boar between two lamps and two *chàmaras* or chowries and above these the figure of an *ankus* and the sun and moon. Below the legend is a row of emblems, which appear to represent sacred implements or marks of distinction, conferred by a *guru* or religious preceptor. The first may be intended for the small portable altar called *vedika*, employed in domestic devotion, the next the *lotus* is always esteemed an emblem of sanctity, the third represents the small table for the implements of worship and the fourth the *swastika* or sacred cross, the inscription of which on any person or thing, is held to confer an especial blessing.

As the preceding relates to one of the first acts of liberality of Víra Déva Chòla, so fig. 2 is connected with an act of munificence on the part of one of his servants, towards the close of his rule. In the 'Saka year 1056 Kolani Kátama Náyadu with the permission of the prince, presented the village of Panduva to certain

* This is given in the words *'sasi-khadwa-indu* or the moon (1) two firmaments (00) the moon, (1)=1001.

Brahmins, as an *agrahàram* and for the maintenance of certain temples. The prominent figure on the seal is the boar, with chowries before and behind, a lotus and two candelabra beneath. Above the animal are a *'sank'h*-shell with the words *Sri-Trib'huvan-anku'sa*, surmounted by a figure of the *ankus*, and the moon.

Figs 4 to 8 are seals of the Ráyar dynasty, as it is commonly called, of Bijanagar. This family rose into power on the decadence of the Chólas in the early part of the 14th century and continued in the exercise of sovereignty over a large portion of the Carnatic, for about 400 years. The first capital was Bijanagar (Vijayanagar also sometimes called Vidyanagar) or Anagundi, from which as they declined in power, they removed to Penugonda in the Bellary province and afterwards to Chandragiri in North Arcot. A *soi disant* representative of the family still resides at Anagundi, subsisting on a pension conferred by the British Government.

All the *'sásanams* of the princes of this family, are inscribed in Nagari characters.

Fig 4, is the seal on a grant of the village of Puligarti in Vella-Nellúr of Jayam-konda-Chóla-mandalam, by Bukka Ráya the first of the dynasty, in S. S. 1216 corresponding with A. D. 1294, recorded on three plates of copper. The use of the territorial denominations shows, that the Chóla authority had only just passed away, if indeed it was not still in existence. The execution of the deed is probably anterior to the assumption of independance by its author.

It bears the figure of the boar, evidently derived from the Chálukya-Chólas, standing on a sort of pedestal with the sun and moon above and a sword in front, the latter now first, apparently added to the normal device, as a distinguishing symbol of the new family.

Fig 6, is the seal of Sadá'siva Ráya one of the most destinguished sovereigns of the race. It bears simply the figure of the boar, with the sun and moon, and belongs to a grant on four plates, of the village of Ayyala-nádu in S. S. 1489 or A. D. 1567.

Figs. 5 and 8 are seals of Venkatapati Déva Ráya, the first recording a grant of the village of Nelatùr in the Varoddagiri síma

(now Vridd'há chalam) inscribed on six copper plates, and dated S. S. 1522 or A. D. 1600, the second is incomplete, one of the 5 plates having been lost, but the remaining plates contain the king's name and the date S. S. 1560 or A. D. 1638. The seal bears the name Venkatará(ya) in Nágari characters, an unusual circumstance in the seals of this dynasty.

Fig. 7 is the seal of Ranga Ráya, on a set of plates recording the grant of a village named Kála-kurichi in the Tìrupati Rájyam in S. S. 1566 or A. D. 1644. This is one of the latest of the series, after the family had retired to Chandragiri.*

Fig. 9 is a copy of a picture of his family insignia or arms, sent to me by Raja Kumári Perumál, the zamindar of Karvétinagaram in the Chittoor district, commonly known as the Bomma Raja Poligar. The sword is here depicted above, instead of in front, of the boar, with the sun and moon on either side, the whole on a circular scutcheon perhaps intended to represent a seal, or the round, flat, vertical parasol called *àftàbgìr* carried over persons of rank, by special permission of the sovereign† and usually emblazoned with a family device. Above this, is a shield surmounted by a falcon of the kind called *sàlva* or *bahri* (falco peregrinus) flanked by swords, flags, bows and quivers, and spears.

It appears from a local history of some merit that the ancient possessors of the Nagaram districts were a family of Sálva Reddis, who migrated with their tribe from the neighbourhood of Pit'hapur in the delta of the Godavery, to the country at the base of the Nagari Hills about the 8th or 9th century.

One of them named Sálva Narasá Reddi obtained the favor of the Chálukya king, Vimaláditya, by his skill as an athlete, and was appointed chief of the country of 'Sesáchalam or Tripati (where he founded a town called Narasàpuram) with permission to use the royal seal and boar signet. This was in the year S. S. 852 (A. D. 930). During the troubles which followed Vimaládi-

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* Since this paper was sent to press I have been favored with the loan of set of copper plates conveying a grant in the Canarese language of ten villages to a temple in Conjevaram by Krishna Deva Wadiyar Ràja of Mysore in S. S. 1646 or A. D. 1743, the seal in which is a boar exactly resembling fig. 7.

† The vaulted horizontal umbrella was always reserved exclusively for royalty, whence the imperial title *ekach'hatra* and *ch'hatrapati* the origin probably of the word *satrap*.

tya's reign, and ended in establishing the ascendancy of the Cholas, his grandson, S. Venkatapati Naidu, was dispossessed, but his son S. Bhìma Náyadu recovered his patrimony in S. S. 898 and built the town of Ratnapuram, now called Kempala pàlem where he founded a temple to Varáha-swámi in honor of the Chálukya family.*

A successful expedition into the Carnatic by Kirtti Varma, the Chéra king of Malabar about the year S. S. 930, in which the Sálva chief sided with the invader, enabled his son Narasinha, a man of ability and enterprize, to assume independence, which he maintained successfully for 35 years to S. S. 979 (A. D. 1057). His possessions extended along the base of the mountains, over the breadth of the Carnatic Balaghat from the neighbourhood of Vellore to the sea, including the three sacred places of Ghati-káchalam (Shòlangad), 'Sesáchalam (Tripati) and Kshani-kàchalam (Tiruttani). He surveyed and assessed the whole of the lands within this space, reformed the weights and measures according to the Sálva standard, so called after his own family name and caused them all to be stamped with the figure of the boar. Although his son S. Bhujanga Náyadu was reduced to subjection by the Western Chálukya king, Sòme'swara Déva and was carried away a prisoner to Kalyán where he died, these institutions were preserved and have remained up to the present time.

Bhujanga Náyadu's grandson recovered his paternal estate in S. S. 999 (A. D. 1077). They were again curtailed to 24 villages by Rája Rája Déva Chola II. in S. S. 1152 (A. D. 1230). But during the next four generations, the decaying power of the Chòlas enabled the Sálva family to regain its independence, which was strengthened by the marriage in S. S. 1236, of S. Narasa Náyadu with the daughter of Prolaya Reddi the founder of the Véma Reddi dynasty of Kondavid in Guntoor.

The family now fell under the rule of the rising empire of Bijanagar, to which the Sálvas continued subject for about 150 or 200

* The remains of this temple still exist and among the ruins, the figure of Varaha swami stands exposed to the open air.

years, when the last of the race was expelled or superseded by the progenitors of the present Bomma Rája zamindar. Sàlva 'Sesáchala Reddi, the then head of the family being without heirs, stipulated only that the annual festivals at Náráyanavaram and Tripati should be conducted in the name of the Sàlvas, since which time the new family have assumed the titles of 'Sriman Ràjadhirája—Sàlva-katári-mahá-ràja, &c., and with the insignia of the Sálva family, have maintained undisturbed the rules and institutions established by their predecessors.

The latest mention of the Sálvas that we have met with occurs in a copper 'sàsanam at Tirunnámalei in South Arcot, in which Krishna Ràya of Bijanagar and the Sàlva Nâyaka, having built a *mantapam* of 1000 pillars at Kánchipuram, (Conjeveram) resolve now to erect a similar one at Arunàchalam (or Tirunnàmalei) on a piece of land, purchased from the inhabitants for 500 *pons.* This endowment, witnessed by the inhabitants of all the kòttams and nádus of Tondamandalam, is dated S. S. 1435 or A. D. 1513.

The traditions relative to the prevalence of the Chàlukya influence in this tract, are confirmed by inscriptions extant in the temple of Agastíswara swámi in Nàràyanavaram, the principal town of the district. One of these records a grant to the temple, of the village of Vikrama-tángal alias Chálukya-puram, by Nága-déva of Vélurpákkam, who had received it with others in reward for services rendered to the general of the Chalukya forces in an engagement with the enemy then occupying the Pòtappinàdu (or Kálastri) country. This was made in S. S. 826, in the 11th year of the reign of Kulòttunga Chòla (probably Rájéndra Chola.)

Another inscription in the temple of Pará'sara in the same town, records the gift of the village of Kandyan by one Pallava Ráya who had received it from Nàgadéva the lord of Pótappinàdu in the 13th year of Uttama Chóla or S. S. 1027.

A third in the temple of Agastíswara Swàmi contains a royal grant of certain lands to the temple, in the 6th year of Tribhuvana Malla Dèva with the titles of Sarvaloká'sraya, the ornament of

the Satyà'sraya Kula, conspicuous among the Chàlukyas, &c., in S. S. 1078 corresponding with A. D. 1151.

Fig 10 is an iron weight bearing the stamp of the Sàlva standard, obtained from Nàrayánavaram. It exhibits the figure of the boar and sword with the sun and moon and on the back are the words *Pramadicha sa.* (mvat-sara) *vi.* (sam.) 1, signifying that this weight of 1 vis was stamped in the cycle year. It weighs exactly 3lbs. 1 oz. 4drs.

Fig 11 is an iron measure marked like the preceding and incribed with the words *Pramadicha sa. sardha pa*, which stand for Pramadicha Sa (mvatsara) half pa(di.) The depth is 5-6 inches the diameter at the top 4·2 and at the bottom 3·9 and the weight of the water it held at 81° Fah. was 1 lb. 19 oz.16 drs. 2 grs.=62½ cubic inches.

Fig 12 is an iron quarter vis of octagon shape with the sword sun and moon engraved upon it, and the year *Pramadicha sa. vi.* / the latter mark indicating one quarter in Telugu notation. Its weight is 12 oz. 2 drachms.

SELECTIONS.

Observation on the Poison of the Upas Antiar. By Professor ALBERT KÖLLIKER.

DURING my stay in England, in the autumn of 1857, I was so fortunate as to acquire the rare poison of the famous *Antiaris toxicaria* (Lesch), with which no experiments have been tried since the time of Magendie, Brodie, Horsfield, Schnell and Emmert (1809-1815). I owe my specimens of the Antiar poison to my friend Professor Christison, of Edinburgh, who had it from Borneo, and to Dr. Horsfield, of London, who collected it himself during his stay at Java in the beginning of this century, and as both specimens were fully active, as some preliminary experiments made in company with my friends, Dr. Sharpey and Dr. Allen Thomson showed, I thought it well worth while to devote some time to the study of the poison, and to try to elucidate its manner of action on

the animal organism. The following are the principal results which I obtained in my experiments with frogs, and I hope that they will not be deemed unworthy of notice by those who take an interest in the physiological action of poisons in general.

The Antiar, like most other poisons, acts from the intestinal canal, and from wounds, but it must be remarked, that it is much more energetic and rapid when introduced into a wound. The symptoms which are observed in frogs, in the latter case, are the following. First of all, the voluntary movements become less energetic, and at length cease totally, 30 or 40 minutes after the introduction of the poison (after 21m. min. and 1h. 21m. max.). Then follows a time in which reflex movements may be caused by stimulating the skin, but this faculty also is lost very soon, viz., at from 50 to 60 minutes (at 33m. min and 85m. max.), and the animals die without the slightest trace of convulsions or tetanic spasm. If now the frogs are opened, we find that, without any exception, the heart has ceased to beat. The auricles are dilated, the ventricle corrugated, rather small, and generally red, as if blood had been extravasated into its muscular parietes, but very soon the exposure of the heart to the air causes the ventricle to shrink a little more, and to become pale and stiff, as if in the state of *rigor mortis.* All interior organs, especially the lungs, liver, stomach, intestine, and kidneys, are gorged with blood, and in a state of great, especially venous, hyperœmia. The blood is fluid and rather dark ; but soon coagulates when exposed to the air, and assumes a brighter colour. The lymphatic hearts cease to beat as soon as the reflex movements are lost. At the same time the nerves are yet found excitable, but their power is very low, and generally vanishes in the second hour after the application of the poison. The same must be said of the muscles, which contract very feebly when directly stimulated by galvanism, and in most cases lose their power totally in the second or third hour, and generally a little after their nerves. The *rigor mortis* begins early, sometimes in the sixth hour, and is generally well established at the eighteenth hour.

Amongst all these symptoms, to which we may add some signs of vomiting occurring now and then, there was none which attract-

ed my attention, more than the cessation of the movements of the heart, considering the great energy which this organ possesses in frogs, and I tried, therefore, before all, to elucidate the action of the Antiar upon the heart. For this purpose I instituted a new series of experiments, in which I exposed the heart by the section of the sternum, before the poison was introduced into a wound of the back, and in this way I easily got the result, that the heart ceases to beat as soon as from the fifth to the tenth minute after the introduction of the Antiar, and so, that first the ventricle stops, and half a minute or one minute later, also the auricles. Now, as the frogs at this time are not at all deprived of their faculty to move, we may have the rather astonishing view of an animal, with artificially paralysed heart, which moves and leaps as freely as if nothing had happened.

The experiments just mentioned prove, that the first action of the Upas Antiar is to paralyse the heart, and I am therefore quite in accordance with Sir Benjamin Brodie, who, by his experiments on *Mammalia*, came to the same result in 1812, whilst I cannot otherwise than disagree with Schnell (Diss. de Upas Antiar, Tubingæ, 1815), who assumes that this poison acts in the first place on the spinal marrow. Now this point fixed, the further question arises, whether the other symptoms mentioned, viz., the paralysis of the voluntary and reflex movements, and the loss of the irritability of the muscles and nerves are only the results of the paralysis of the heart, or must be attributed to a specific action of the Antiar. For the elucidation of this question, I found it necessary to study the consequences of the suppression of the heart's action on the organism of frogs, which I did in the same way as it had been done by others, especially by Kunde Müller's Archive (1847), viz., by cutting out the heart, or by putting a ligature around the base of it, so as to stop the circulation totally. The results of these experiments were in both cases the same, that is to say, the voluntary movements ceased in from 30 to 60 minutes, and the reflex movements after one or two hours. Hence it follows that these two symptoms of the poisoning with Antiar are simply dependent on the paralysis of the heart caused by it. With refer-

ence to the irritability of the muscles and nerves, on the contrary, it is easy to show that the ligature or excision of the heart has not the same influence as the Antiar, inasmuch, as in the first case the muscles and nerves are found irritable six or seven hours, and more after the experiment has been made. Therefore it may be said that the Antiar has a direct action on these organs.

These points once demonstrated, there remained one more question to elucidate, namely, whether the Antiar acts only upon the muscles, or also upon the nerves. If we consider that the Antiar undoubtedly paralyses the muscles, we may easily see that the loss of the excitability of the nerves possibly depends merely upon the impairment of the muscular contractility, and is therefore not real, but only apparent. With a view to determine the real state of things, I tried a third series of experiments, poisoning frogs in such a manner that the muscles of one limb were kept free from the influence of the poison. This was done in two ways, first, by putting a ligature round the crural artery and vein of one leg, and secondly, by cutting through a leg entirely, after the ligature of its vessels, with the exception only of the ischiatic nerve. In poisoning frogs treated in one of these ways, through a wound of the back, I found that, with the exception of the heart, the Antiar acts in the first instance upon the muscles. This is shown by the fact, that in the second hour, at the time when the muscles of the poisoned parts have lost their irritability, the nerves of the sacral plexus in the abdomen still possess their full influence upon the muscles of the leg which has been kept free from the action of the poison. One might be inclined from this to conclude, that the nerves are not at all acted upon by the Antiar, but this inference would be erroneous. In fact, the experiments just mentioned, if followed a little longer, show that in the third or fourth hour the sacral plexus also becomes inactive, at a time when the muscles of the non-poisoned leg are fully contractile. The Antiar, therefore, paralyses also the nervous trunks, but later than the muscles.

From all the experiments, it seems to follow that the Antiar is a poison which acts principally upon the muscular system (the heart and the voluntary muscles), a conclusion in favour of which

I may further add, that the muscles and the heart of frogs poisoned by Urari (Woorari, Ourari) lose their irritability totally, and in a short time, if Antiar is introduced into a wound some time after the Urari. If we consider that, as I have shown (see Proceedings of the Royal Society, 1856, p. 201,) the Urari only acts upon the terminations of the nerves in the muscles, and does not effect the irritability of the heart and muscles at all, we may conclude, that a poison, which, as the Antiar, is capable of paralyzing the muscles after the Urari, has really a direct action upon the muscular fibre. The results of my investigation into the effects of the Antiar upon frogs, are therefore the following.

1. The Antiar is a paralyzing poison.

2. It acts in the first instance and with great rapidity (in 5 to 10 minutes) upon the heart, and stops its action.

3. The consequences of this paralysis of the heart are the cessation of the voluntary and reflex movements in the first and second hour after the introduction of the poison.

4. The Antiar paralyzes in the second place the voluntary muscles.

5. In the third place it causes the loss of excitability of the great nervous trunks.

6. The heart and muscles of frogs poisoned with Urari may be paralyzed by Antiar.

7. From all this it may be deduced, that the Antiar principally acts upon the muscular fibre and causes paralysis of it.

So much for this time. My experiments with the Antiar upon warm-blooded animals have only begun, and I am not yet able to draw any conclusion from them. As soon as this will be possible I shall take the liberty to submit them to the Royal Society, together with the results of my experiments with the Upas Tieutê, which poison I had also the good fortune to obtain through the kindness of Sir Benjamin Brodie and Dr. Horsfield. With regard to the Antiar I may further add, that experiments made indepen-

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NOTE.—This famous poison consists chiefly according to Schomburgk of the *Strychnos toxifera.*—ED. M. J.

dently, and at the same time, by my friend Dr. Sharpey with this poison, have conduced to the same results as my own. *Proceedings of the Royal Society.*

On the Brine-springs of Cheshire. By AUGUSTUS BEAUCHAMP NORTHCOTE, F. C. S.,* *Senior Assistant in the Royal College of Chemistry.*

THE existence of salt deposits in Cheshire, and of the brine-springs which flow from them, has from the earliest historic periods exercised a very peculiar influence upon the economic features of that county. It appears from the records of Domesday, that salt was even then one of the principal articles of its commerce, and that at a period anterior to the Norman conquest it brought in a considerable revenue to the Crown, for as early as the time o Edward the Confessor, the Wiches, as they were called, are stated to have been very productive, and the tolls levied upon the amount of salt sold were divided in the proportion of two-thirds to the King and one-third to the Earl of Chester. Upon the Conqueror's accession, the earldom was given to Hugh Lupus, his nephew; but the property attached to it had diminished in value; for it is recorded that the salt-works at Middlewich aud Nantwich, which under the Saxon rule had produced a rental of £16 per annum, had fallen into complete disuse; and that those of Nantwich, from which an annual income of £20 had been derived, were almost as much neglected, for out of eight salt-works which had formerly flourished at this latter place, one only was at that time in operation, This period of depression was not, however, of long duration, for shortly afterwards a partial recovery had taken place since the Nantwich salt-works are spoken of as being let to farm by the Crown for £10, the Middlewich at 25s., and the Nantwich at

* Communicated by the Author.

35s. per annum.* It is thought probable that at this period, the chief export of Cheshire salt was to Wales, for the Welsh gave to Nantwich the name of Hellath Wen, or the white salt-pit; much export trade could not have been carried on, for very long after this date, the salt manufacture of Cheshire did not exceed the consumption of the county itself, and a few of its immediately adjoining neighbours.†

It is curious to observe how the importance of places decreases in course of time through the effect of influences, at first apparently but slightly adverse, becoming under somewhat altered circumstances highly detrimental. Nantwich throughout the whole of its early history held the first rank among the salt-producing towns,—there were situated the brine-pits which Henry III. stopped up in order to distress the Welsh by cutting off their supply of that necessary article of food; and when this embargo upon the commercial activity of the town was withdrawn, we find it far surpassing its former self in the energy of its undertakings. This increasing prosperity and wealth continued until it reached a culminating point, from which it has ever since gradually but irretrievably descended. It seems to have attained its summit in the time of Henry VIII., for Leland states that at that time Nantwich contained 300 salt-works: their reduction then began, and in the early part of the reign of Queen Elizabeth their number had decreased to 216, whilst in 1624 they had dwindled nearly to 150. The cause of this declension was want of water-carriage. Nantwich being unfortunately situated beyond that point of the Weaver up to which it was navigable; a more advantageous locality was therefore sought for; the banks of the river were examined, and other springs found in more favoured situations, possessing moreover in addition to superiority of position, the no less important advantage of greater concentration. From the date of that discovery the salt manufacture in Nantwich steadily declined, although the inhabitants still repaired annually on Ascension day to the "Old Biat," their most ancient salt-pit, and adorning it with flow-

* Lyson's *Magna Britannia*, Vol. II, part II, p. 408, (1810).
† *Ibid*, pp. 408, 409.

ers, ribands, and green boughs, they danced round it to their rustic music, and sang a hymn of thanksgiving for the blessing of the brine. This old custom was discontinued about the middle of the last century, for the blessing which they celebrated was fast leaving them. In 1810* one salt-work only existed in the town, and that is now, I am told, done entirely away with and the pit closed. But while Nantwich has been thus descending in the scale, Middlewich and Northwich have been increasing in importance ; and along the lines of water-communication, the rivers Weaver and the Grand Trunk Canal, which runs parallel with the river Wheelock, other places have sprung up from time to time. Of these the most important appear to be, Winsford on the Weaver considerably below Nantwich, Marston and Winnington on the same stream in the immediate neighbourhood of Northwich, and Anderton somewhat nearer the river's mouth ; whilst on the Wheelock, in the vicinity of Sandback, several works of great consequence have been established. A few statistics will show the immense increase which this branch of manufacture has undergone within a comparatively short period. Within the ten years from 1800 to 1810, the amount of salt produced in Northwich is said to have doubled, and the annual average of white or manufactured salt sent down the Weaver from Winsford and Northwich during that period was 139,317 tons ;† this appears to have been the entire amount shipped on the Weaver, and is therefore comparable with the total quantity of white salt‡ (as distinguished from rock salt) which was carried down that river in the year 1832, which amounted to 383,669 tons, and which by the year ending April 5, 1856, had increased to 709,514 tons. With this, other accounts agree ; for Lyson states that in 1805-1806, the total annual produce of the Cheshire brine-pits, those of Nantwich and Frodsham excepted, was 16,590 tons ; whilst at the present time single manufacturers, such as Mr. Blackwell of Wheelock, and Messrs. Ray of Winsford, produce respectively 70,000 tons, and from 50,000 to 60,000 tons of salt per annum.

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* Lyson's *Magna Britannia*, Vol. II., part II., p. 703.
† *Ibid.*
‡ Ure's Dictionary of Arts and Manufactures, 3rd edit., p. 1091.

The salt which is now produced in Cheshire is made, I understand, exclusively from natural brine-springs; but it has formerly at various times been obtained by dissolving rock-salt in water and evaporating the clear solution. The principal varieties manufactured are three: the salt of coarsest grain, or bay-salt; that of the finest grain, to which the name of table-salt is applied; and an intermediate variety, which is called common salt. The latter is made in the largest quantity, and forms the principal part of the vast export of Cheshire. More than three-fourths of the total amount of salt produced is used for foreign consumption; and of the remaining fourth, a considerable portion is employed in the supply of the British fisheries. It has, however, only attained its reputation after a somewhat severe struggle with foreign competitors; for in the year 1810, Mr. Henry* found it necessary to set forth an apology for British salt as an agent in curing provisions in no way inferior to that prepared from sea-water by evaporation on the shores of the Mediterranean, and to deprecate the folly of Great Britain in expending large sums of money in the purchase of an article, which she possessed the means, beyond almost any other country in Europe,—drawing from her most internal resources. Fortunately these remonstrances were not addressed in vain, and this country soon ceased to neglect her native produce, and to import that from abroad which she had in such abundance and of such excellent quality at home.

The great means however, of extending the salt trade in this country, has been the gradual improvement in the mode of raising and evaporating the brine. Originally, in the early days of the manufacture, the method of obtaining salt from the brine by evaporation was unknown; and its preparation consisted only in pouring the brine upon burning branches of oak and hazel, from the ashes of which the deposited salt was afterwards collected. At length, however, the plan of evaporation was devised; but for a long time wood was the only fuel, of which such immense quantities were consumed at the salt-works in Droitwich in the time of Camden, that he represents Feckenham Forest and

* Phil. Trans. Royal Soc., 1810, p. 89.

the neighbouring woods as becoming perceptibly thinner and thinner day by day. This havoc seems to have been continued, notwithstanding, until the middle of the seventeenth century, when the gradual introduction of coal superseded the more primitive kind of fuel.* In the methods adopted in raising the brine, great alteration also has taken place in the lapse of time; at Northwich, in Camden's time, a pit existed which furnished an abundant supply, but the way in which it was brought to the surface was crude in the extreme; the pit was provided with stairs, by means of which men descended with leathern buckets; these they filled with the water, and then ascending emptied their contents into troughs, which served as reservoirs for the wich-houses.† From manual labour they passed to the employment of horses for this purpose; water-power and wind-mills were subsequently used; but all have been superseded of late years by the superior efficiency of the steam-engine. The methods of evaporation have also undergone vast extension and improvement. In early times this process was conducted in small leaden vessels six of which they had in every house at Nantwich, and the salt was removed by women with little wooden rakes, placed in baskets, and drained.‡ These six leaden pans were afterwards exchanged for four iron ones, about 6 inches in depth and of a surface of about a square yard, capable of holding the same contents as the original leaden vessels. The limited extent of the operations thus conducted diminishes our wonder at the great proportion of wick-houses existing at these places during the middle ages, and so far surpassing the number in operation at the present day. Even so recently as a century ago, the largest pans at Northwich were only 20 feet long by 9 or 10 broad; whilst those employed 40 years since had a superficies of 600, 800, and 1000 feet, with a depth of from 16 to 18 inches. The area of the pans has now, I suppose, almost reached its limit; some which I saw at Mr. Blackwell's works at Wheelock having a length of 70 feet and a width of 23 feet, making 1610 feet of surface. The heat is generally applied directly by the flue of from one to three

* Holland's *General view of the Agriculture of Cheshire*, p. 71.

† Ibid, p. 48.

‡ Ibid, p. 50.

furnaces, placed at one extremity of the pans, but in the works of Messrs. Ray, of Winsford, I found part of the evaporation conducted upon a different principle : a small iron pan, heated by a furnace in the ordinary way, is made to communicate by a narrow channel, with a brick or clay-lined basin ; this again is in connexion with others of the same description disposed around a centre, and lastly, one is arrived at immediately adjoining the first mentioned iron pan ; the brine is here by a very simple kind of pump transferred to the heated iron vessel, by which means the level of the liquid in the brick basins is kept constantly below that in the original starting-place, and thus a continual circulation of the brine is maintained.

In the preparation of salt from brine, various substances have been at different times added, from the idea of improving the quality of the product. Until recent times it was thought, that during the evaporation of an aqueous solution of chloride of sodium, hydrochloric acid was expelled, and soda formed : this doubtless arose from the decomposition of the chloride of magnesium contained in the brine which the experiments were made,—an evolution of acid vapours having been probably observed during the incipient drying of the salt. In order to counteract this supposed evil, acids were added, and it was imagined that the excellence of the Dutch salt was due to a skilful admixture of whey, which the manufacturers were alleged to make with their brine during the evaporation, which prevented the injurious effects of the free alkali. Another very favourite class of adjuncts has always consisted of substances which contain constituents possessed of the property of coagulating upon the application of heat, which clarify a liquid by entangling all suspended particles of solid matter in the meshes of their coagulum, and carry them with it as it rises to the surface. Those substances which contain albuminous or gelatinous matters are peculiarly adapted for this purpose, and are constantly used in a variety of manufactures for the attainment of this end. Blood, white of egg, glue and cows or calves' feet have long been used in this way in salt-making. In 1670 the Nantwich salt-makers are described as mixing twenty gallons of brine with two quarts of blood, and adding about two quarts of

this clarifying liquid to a pan which held 360 quarts of brine. In 1810 this process was still adopted in some of the Cheshire works, but I am not aware that it is ever used at the present day. At Droitwich the use of white of egg seems to have prevailed. Various vegetable infusions, still containing albumen, as linseed, mucilage and ale, were, in the early days of manufacture, in great repute, but have, I believe, now fallen almost entirely into disuse.

In order to prevent that most unpleasant circumstance attendant upon the evaporation of all concentrated saline solutions,—the formation of a pellicle upon the surface of the liquid, which gradually becomes a thick layer of salt, and seriously impedes evaporation—another class of bodies are mixed with the brine; these are oils or butter, which, spreading over the whole area, by a peculiar molecular action prevent the formation of any pellicle, or "setting over" of a pan, as the workmen term it, and preserve that open surface which is most favorable to evaporation. The action of finely-powdered resin in effecting this is perfectly magical, the introduction of a very few grains being quite sufficient instantly to clear the surface of the largest pan, and to prevent any recurrence of the formation of the pellicle. This substance was also formerly thought to perform another function, viz., the production of a salt of finer grain; wheat-flour was also believed to exert the same action, whilst alum was added in order to facilitate the formation of larger crystals; but I believe it is now found that the regulation of the degree of heat employed in the evaporation will influence the size of the crystals with the utmost nicety, and that attention to that circumstance alone is sufficient to produce all the varieties which are found in the market. In Holland's "General view of the Agriculture of Cheshire," to which I am so much indebted, and to which such frequent reference has been made, will be found a list of the varieties produced at different temperatures; according to it, the finest table-salt is deposited from the brine at its boiling temperature (220° F.), and the coarsest description by slow evaporation conducted at from 100° to 110° F.

The derivation of the brine in Cheshire is too well known to require any observation: the immense beds of rock-salt which occur in the new red sandstone of that county are familiar to every

one. The existence of this substance appears to have first evidenced itself by the saline springs which at various places rose to the surface; and the majority of these spontaneous appearances seem to have occurred in the immediate vicinity of the course of the river Weaver, and of the lesser stream, the Wheelock. The former of these rises in the south-west portion of the county, and after running south for some miles, turns at Audlem to the north, passes Nantwich, and after some distance, Winsford; receives the Wheelock about Northwich, and passing Marston and Anderton, proceeds to the Mersey. The Wheelock rises in the south-east part of Cheshire, and passing the village of the same name, flows by Middlewich to its confluence with the Weaver. Along the banks of these streams a continual succession of places occurs which have at various times been famous for the production of salt; and although great fluctuations have taken place, yet these have been due rather to incidental causes than to any failure of material;—imperfections in shafts allowing the admission of fresh-water springs, and a slight distance from the convenience of water-carriage, are reasons quite sufficient for the transfer of the manufacture from one place to another. Causes such as these probably led to the abandonment of the works at Dunham in the north-east of the county, and of those at Droitwich in the south-west; yet the occurrence of brines at these places is interesting, as indicative of the position and extent of the beds of salt below, the two places being about thirty miles apart, and about equidistant from the centre of the district which is now the salt-producing one. This region may be said to lie north-west and south-east, and to be composed of three divisions,—the Northwich, the Middlewich, and the Sandback: the first comprehends Northwich, Marston, and Anderton, besides various other places near them; the second embraces Middlewich and Winsford, with the surrounding neighbourhood; and the third of more limited extent with respect to actual operation includes Sandback, Wheelock, and a few villages in the immediate vicinity. In order to obtain fair samples of the Cheshire brines, I therefore took specimens from each of the above districts. From the Northwich district I obtained two, from springs a few miles apart, through the kindness of Mr. Johnson Fletcher; the places selected in this instance were Anderton and Marston;

proceeding in the south-easterly direction, a specimen was chosen from the active department of Winsford, in the central district, and Messrs. Ray and Son furnished me with the brine which they employed; whilst in the extreme south-east, Mr. Blackwell provided me with samples from the spring which supplies his extensive works at Wheelock.

The depth at which the brine is found, and the level to which it rises, vary very much at different places. It appears that it is generally necessary to sink from thirty to fifty yards, in some cases even to a depth of eighty yards, before the spring is arrived at; the water then rises in the shaft to within from twenty to ten yards of the top, sometimes even to the surface. The general level of the brine in the pits is, however, far below this standard, as its removal by the pumps is so rapid as never to allow it to rise to its full height.

As in the case of Worcestershire brines, I was desirous of ascertaining whether the composition of these springs varied with the different seasons of the year, with this view analyses were made in every instance of separate specimens taken respectively in January and August, and, as I had already found in the case alluded to, no difference worthy of note existed between them.

The analytical methods which have been adopted in the examination of these brines, are precisely those described in the former memoir on the Worcestershire springs; instead, however, of evaporating small portions of the waters to obtain mother-liquors and residues which might contain the rarer constituents, I obtained portions of the liquid which remains in the pans after the removal of the salt, and of the solid cake of earthy matter which adheres so tenaciously to the bottom of the pan as to require separation by the pick, and is called by the workmen "pan-scale." The former of these was tested for potassium, bromine, iodine, and phosphoric acid; and the latter for arsenic, antimony, tin, iron, manganese, aluminum, strontium, and fluorine. The brine itself was also examined for silica, for organic matter and its resultants, ammonia and nitric acid, and the metals precipitable by hydrosulphuric acid. The principal constituents of these waters are

sodium, calcium, magnesium, chlorine and sulphuric acid. Of the bodies occurring in less quantity, a minute trace of potassium was found, a small quantity of iron with a little alumina and considerable traces of manganese, not, however, in proportions capable of determination. Bromine was ascertained to exist in rather large quantity, the unconcentrated brines becoming distinctly yellow upon the passage of a few bubbles of chlorine; this element was, therefore, determined by the method recommended by Fehling,* which depends upon the fact, that if a solution of chloride of sodium containing a small amount of bromide be insufficiently precipitated by nitrate of silver, the precipitate nevertheless contains all the bromine present; the bromine in the mixed precipitate of chloride and bromide of silver is then determined by the passage of chlorine over the fused mass in the usual way. The results yielded by this process, which were carefully and frequently repeated upon very different quantities of brine, agreed among themselves in the closest manner. The existence of iodine was proved in all the waters, but the quantity present was minute in the extreme. In one case also an indication of fluorine was obtained by the apparently etching action exerted upon a watch-glass in the application of the test now usually employed: these markings, however, on the parts uncovered by wax, although quite obvious when the newly-cleaned glass was breathed upon, were perfectly imperceptible when the same watch-glass was taken up a day or two later and re-wiped for the purpose of fresh examination.† Since that experiment, M. Nicklès's observations‡ on the fallacies incidental to this method of testing have appeared; and this doubtless was a case such as he describes, in which the vapour of any acid, or even of water, may exert such an action (not chemical, I presume, but physical), and fix upon glass any design at first traced upon the layer of wax. The search for the remaining substances above mentioned was unsuccessful, and they were therefore presumed to be absent.

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* Fresenius, *Quant. Analysis*, p. 345. 2d Eng. edit.

† I accounted for this at first by imagining that a thin film of wax might be impressed by the needle upon the glass, which was not immediately removable by the first cleansing.

‡ *Comptes Rendus*, March 30, 1857, p. 679.

I will now proceed to state the results which the analysis of these brines has afforded me, premising them simply by naming the sources from which they were derived. I. Andertone brine, from the pit of Lord Stanley of Alderley. II. Marston brine, from the works of the executors of the late C. W. Newman, Esq. III. Winsford brine, from the shaft of Messrs. Ray and Son. IV. Whelock brine, from the works of Mr. Blackwell.

	1 Anderton Brine.	2 Marston Brine.	3 Winsford Brine.	4 Wheelock Brine.
Specific gravity of Brine.	1·2048	1·2001	1·2049	1·2013
Reaction of Brine	Feebly Alkaline.	Feebly Alkaline.	Slightly Alkaline.	Feebly Alkaline.
Saline matter contained in a gallon of Brine...	Grains.	Grains.	Grains.	Grains.
Chloride of Sodium	21704·712	21187·234	21528·550	21302·772
Bromide of do.	8·686	9·240	13·326	16·986
Sulphate of Lime	382·885	328·467	379·543	351·500
Carbonate of Soda	19·397	30·242	26·989	....
Carbonate of Lime.....	1 686	....	5·060	43·727
Carbonate of Magnesia.	63·252	89·887	155·191	84·977
Sulphate of Soda.......	....	122·650	....	....
Chloride of Magnesium	....	....	....	143·795
	22180·618	21767·720	22108·659	21948·758

Toward the latter part of the autumn of last year, a considerable panic was created by a sudden outcry being raised that the supply of brine was rapidly diminishing over the whole of Cheshire. I made at the time many inquiries as to the truth of this statement, which had found its way into the public journals, and it proved, as is usual in such cases, that the accounts although based upon truth, was very much exaggerated. A diminution in the supply of brine is a phenomenon of no unfrequent occurrence, and is in fact of two kinds—periodical and occasional. A periodical sinking of the water in the brine-shaft is found to occur in the summer season, the brine rising with the approach of winter, and attaining its highest level about December or January: these alterations have generally been very regular, but during the year 1856 a total

departure from the usual variations took place, which, ending in a rapid sinking of the brine during the months of November and December, originated the fears which were entertained of a general failure being at hand. I have been enabled to obtain a statement of the fluctuations in the level of the brine in a pit at Anderton during the two normal years 1854-55, and the abnormal year 1856, by which the matter is clearly exemplified. The shaft upon which the observations were made, was between 70 and 80 yards deep, and the numbers given express the height in yards to which the brine rose.

	1854	1855	1856
January	15-16	30	24—30
February		35	23—24
March	10-7-35-20	gradually receding	18—24
April	Gradually receding.		18—19
May			17—19
June			17½—19
July	6	4	17—19½
August	7	4	19—19½
September	7	4	19—20
October	8-20	increasing	20—22
November	20-25	22	18—11
December	30	30	10—11

By this account it is seen that in ordinary years the average depth of the brine in the shaft is thirty yards in the depth of winter, whilst in the midst of summer five yards may be taken as the mean; and the origin of the alarm in 1856 was evidently the observation of a diminution setting in at a period at which an increase had usually happened hitherto. The fact, however, appears to have been disregarded, that in the warmer period of the year the supply of brine had been far more abundant than was generally the case, nor am I aware that any attempt was made to explain this part of the phenomenon. The sudden decrease was attributed by those on the spot best able to form an opinion to one of those dislocations of strata which frequently on a smaller scale cause the occasional failures in the supply of brine: a sudden subsidence of land in one part of the Northwich district, to the depth of a three-

storied building, is described as having occurred simultaneously with this sinking of the brine, and it was believed that in some of the deserted mines which honey-comb the rock-salt strata of that region, the pillars of salt, which are always left to support the roof, had been removed by the action of water, and the immense weight of the superincumbent mass had then caused the excavation to collapse. By an extensive disarrangement of this nature, either some new channel of escape might have been opened for the brine, or at least the communication between some of the streams or reservoirs might have been closed or interrupted. Similar occurrences, although with a converse effect, have happened in earlier times; and two instances are mentioned by Holland, in one of which, near Bickley, and also in the neighbourhood of Combermere Abbey, the ground suddenly sank to a depth of many feet, and the brine not being removed with the same rapidity as in the present day, forced its way to the surface upon its old subterranean channel or reservoir being filled up, and formed a pool of considerable size in the depression caused by the collapse of the strata.

The failure of 1856 appears to have been partial only, as would be naturally expected if due to the alleged cause; it seems to have been almost wholly confined to the Northwich district; at Winsford it was slightly felt, but was there attributed more to increased pumping than to any natural cause; whilst in the Sandbach department I believe no complaint of any kind was raised. The derangement, such as it was, seems to have been only temporary, for no complaints have since been made of the occurrence of any scarcity.

On the Properties of Wood Oil. By M. Guibourt.

An analysis of *Wood-oil* or *Gurjun Balsam* was made by Mr. Charles Lowe* in 1850. He only knew it as a resinous liquid extracted from an Indian tree and believed it to be balsam of

* Pharm. Jour. Vol. xiv. 65.

Copaiba, rendered turbid by a greenish resin suspended in it. The following were the results obtained by him from the balsam which was found by filtering to give a brown transparent liquid yielding by distillation.

Essential Oil	65
(Hard) Resin	34
Acetic Acid and Water	1
	100

According to Mr. Lowe, the volatile oil possesses all the characters of that of copaiba; and the "*hard* resin," which he regards as pure copaivic acid, free from the "*soft* resin," which, according to him, exists in the greater part of the copaiba of commerce, appears to him indicative of superiority as a medicine. I must acknowledge that I but ill-comprehend this conclusion, and that I am the less convinced of the identity of the *hard* resin with copaivic acid, since Mr. Lowe has recognized in the new resinous balsam the singular property of becoming solid when exposed in a closed vessel, to a temperature of 230° Fah. Copaiba presents no similar phenomenon.

I find stated moreover this difference, viz., that the new balsam distilled with the addition of a small quantity of an oxidizing agent, as chlorine, hypo-chlorite of lime, or bichromate of potash, yields an essential oil of a fine blue, whilst ordinary copaiba containing "*soft* resin" (I still can scarcely understand), affords hardly any coloured essential oil. The notice concludes with pointing out a possible sophistication which appears to me little to be feared; it is, that cold sulphuric acid produces with copaiba a purple colouration similar to that obtained with cod-liver oil, so that, as the author supposes, dishonest persons might substitute for the latter, a mixture of olive oil or of some other fatty oil, mixed with a small proportion of copaiba.

Mr. D. Hanbury* informs us in his notice, that wood-oil is extracted from *Dipterocarpus turbinatus* by a very peculiar process, which I will state in a few words, in order the better to show the nature of the product. To obtain the oil, a large incision is made

* Pharm. Jour. Vol. xv. 321.

in the trunk of the tree at about 30 inches from the ground, on which a fire is lighted and kept up until the incision is charred: soon after this, the liquid begins to flow. It is conducted by a little trough into a vessel placed to receive it. The average produce of one of the better trees in a single season is 30 gallons. Roxburgh (from whom this account is taken*) adds that *wood-oil* is also produced by *Dipterocarpus incanus*, *D. alatus* and *D. costatus*. The first of these three is reputed to yield the best sort, and in the greatest quantity.

The wood oil which forms the subject of Mr. Hanbury's notice has been imported in large quantity from Moulmein in Burmah. When filtered, it is a transparent liquid of a somewhat dark brown color when seen by transmitted light, but appearing opaque and of an obscure green if viewed by reflected light. It possesses therefore, in a very marked degree, the dichroism observable in all resin-oils obtained by the action of fire. I particularly notice this character which determines the nature of wood-oil, and shows that it is not simply a natural product like Copaiba; but that it is in part the result of a liquid modification of the *Dipterocarpus* resin, effected by the agency of heat. This Moulmein wood-oil is of somewhat greater consistence than olive oil; it has a sp. gr. of 964, and possesses an odour and taste very analogous to those of Copaiba. It dissolves in twice its weight of absolute alcohol, with the exception of a minute residue which is deposited upon repose.

But the most curious property of this oil, already recognized by Mr. Lowe, and afresh observed by Mr. Hanbury, is that of solidifying when heated in a closed vial to 266° Fah.; at this temperature the oil becomes turbid and so gelatinous, that it is not displaced upon the inversion of the vial. After cooling, the solidification is yet more perfect; but a gentle warmth, assisted by slight agitation, restore its former liquidity. Mr. Lowe has given the temperature of 230° Fah. for the solidification of the oil: I suppose that the different temperatures noted by these two observers, may be accounted for by some difference in the liquids on which they operated; for as the sorts of Copaiba furnished by different

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* Flora Indica Vol. ii. 613.

species of American COPAIFERÆ and the turpentines by various pines and firs, are not identical, so we may reasonably conclude that the wood-oils yielded by various species of *Dipterocarpus* are not absolutely similar; the greater or less degree of heat to which the oil has been subjected in the process of extraction, may also cause a variation in the properties of the product.

What I assert here is not a matter of supposition, but at present of certainty. At the Universal Exhibition of 1855, there were two samples of wood-oil, the one sent from Canara, the other from Tenasserim. One of these samples (I do not know which) enclosed in a small white earthen pot, which in fineness of paste was midway between stone ware and porcelain, had been given by Dr. Royle to M. Delesse, the member of the International Jury who had been commissioned to report upon the bitumen and petroleum forwarded to the Exhibition. M. Delesse, not finding it to be what he was seeking, sent me the specimen, which I judged at once must be the new copaiba announced by Mr. Lowe. In fact, it approached much nearer to the balsam examined by Mr. Lowe than that which has been presented to me by Mr. Hanbury.

The wood-oil of Mr. Hanbury has almost the liquidity of olive oil; held up to the light of the sun, it is seen to be perfectly transparent, and of the colour of dark malaga wine; seen by reflected light, it appears opaque, and of an olive green. With ammonia and magnesia, it behaves in a very different manner from copaiba. Mixed with liquid ammonia of 22° B., in the proportion, by weight, of 5 parts of wood-oil to 2 parts of alkali, it immediately forms an opaque and very thick mixture, which does not alter by keeping.

It does not solidify upon the addition of a sixteenth of its weight of calcined magnesia, and the two bodies separate upon repose.

The wood-oil of M. Delesse has the appearance of a thick and slightly gelatinous liquid. After having deposited a small quantity of green resin which was suspended in it, it became almost transparent: placed between the eye and the sun, it is seen to be of a pure deep red: viewed by reflexion, it still appears red, but tur-

bid, and resembles a liquid in which finely-powdered cochineal might be suspended. The complementary colour of red is not therefore apparent by this means, but it becomes manifest when, after agitation, a thin layer of liquid covers the upper sides of the bottle. Then in whatever way we look at this thin layer, it appears of a beautiful green hue.

This same green colour appears again and remains, when, after having dissolved the wood-oil in alcohol, the solution is left to spontaneous evaporation: one may then see towards the upper part of the capsule, between the portions of green resin, white starry tufts which are due to a peculiar principle, the future examination of which I leave to those who have a larger quantity of the liquid at their disposal. As to the resin, it has acquired a permanent green hue, which is also perceptible in the dry resin which remains after the wood-oil has been boiled for a considerable time with water. This green colour, which is that also of the beautiful Piney Resin (*Vateria Indica L.*) that was shown at the Exhibition, establishes a point of relation between two products originating in trees belonging to the same family, that of the DIPTEROCARPUS. But there the resemblance stops, for the resin of Vateria Indica is insoluble in alcohol, and very imperfectly so in Æther, whilst the green resin of wood-oil is easily soluble in either of these menstrua. Finally, the wood-oil of the Exhibition behaves as copaiba, when treated with ammonia or calcined magnesia. With one-sixteenth of calcined magnesia it very speedily solidifies, and a mixture of it with ammonia becomes liquid, and almost transparent, after an instant of opacity.

I am far from concluding with Mr. Lowe that the two oleoresinous bodies (copaiba and wood-oil) are chemically identical; but as regards their employment in medicine, I think, as in the case of bodies of analogous composition, such as turpentines and balsams, liquid or solid, all their vegetable components may be of use as a remedy for a catarrhal condition of the mucous membranes. I may remark in conclusion, that Mr. Hanbury's wood-oil, and that from the Exhibition, have probably not been extracted by a similar process. It seems to me that the former has been obtained by the action of fire in the manner described by Rox-

burgh; the latter has doubtless been obtained without the intervention of this agent, for I do not find in it the indication which characterizes oils that are the result of the action of fire upon resins.—*Pharmaceutical Journal, Vol.* 16, *p.* 332.

MR. WAYNE *on the Oil of Cotton Seed.*

THE great quantity of cotton produced in India and the little use made of the seed, save as food for cattle, give value to the following notice of the practice, in America, of extracting an oil from the seed:—

"The manufacture of oil from cotton seed is not a novelty; a small quantity has been made at the South for some years past; lately, however, the demand for lubricators has turned the attention of many to the cotton seed (immense quantities of which are allowed to rot, or used only as manure upon the cotton fields of the South) as a material from which large quantities of oil might be profitably obtained.

"At New Orleans I have been informed that a quantity of this oil has been of late produced, a sample of which I have seen. It was very bland, light coloured oil, said to be made by steaming the seeds and collecting the oil by skimming it from the surface of the water. I cannot vouch for the correctness of the above process.

"In Cincinnati some of the oil millers have made the attempt of pressing cotton seed for the oil, but the experiments so far, I believe, have been unsatisfactory, both in regard to the quality of the oil obtained and in the cost of it.

"The oil, to be made profitably, should either be manufactured in the vicinity of the cotton plantation, as the seeds from the attached fibre are bulky, and the cost of transportation an item; or the seed should be hulled at the spot and shipped to the place where it is to be pressed in that condition, as it requires three or four bushels of seed in the wool to produce one bushel of hulled seed ready for the mill.

"The oil as it runs from the press is of a very dark red colour. After standing some time it deposits a portion of the colouring matter, also a portion of the semi-solid fat, and in cold weather this is deposited to a large extent; and is only partially taken up upon increase of temperature. The colour of the oil obtained by pressure is one great objection to its general use, and is very difficult to remove; in bleaching it, at least ten or fifteen per cent. of the oil is lost, a portion of which may be recovered, and used in the manufacture of soap, for which purpose cotton seed oil is better adapted than for any other purpose. It is a drying oil, consequently not fit for lubricating, and when burnt gives a smoky flame, and forms rapidly a crust upon the wick. Others say that it answers for both purposes; but all I have met with, upon being used practically for lubricating or burning, gave unsatisfactory results.

"A very good soap is made from it in New Orleans for common purposes: but I think that a soap in every respect equal to the imported Castille could be cheaply made with it.

"The dark colour of the oil obtained by pressure is due to the presence of a dark resinous substance, presenting itself in small dots throughout the seed. These may readily be seen by examining a section of the seed with a lens, or even the naked eye.

"The hull and attached fibre are useful for paper stock, and the cake left after the extraction of the oil is nearly as valuable a food for cattle as that of linseed.—*Pharm. Jour. Vol.* 16, p. 335.

ORDER RADIATA.*

Class Hydromedusæ.

ALL Medusæ are naked jelly-like animals, with a body sometimes disc, sometimes bell-shaped, the edge of which is often furnished with threads, and which by its alternate contraction and ex-

* We are indebted to Captain Toynbee of the *Gloriana*, for this translation from a German work descriptive of various families of pelagian animals. It was made by him for his own use during the interesting researches he has been engaged in carrying on for the last 3 or 4 years among these tribes during his voyages to and fro between India and England.

pansion propels it through the water. On the lower surface of this glass-like transparent body the mouth is to be found, or the sucking organ which takes the place of a mouth, often surrounded by stalk-like appendages; and these together with the umbrella-shaped body, give them much the appearance of mushrooms.

The bodies of the Medusæ are composed of cells; about as hard as gristle, covered by a tender upper skin, in which stinging organs are to be found, generally similar to those of the Polypi; indeed all who are accustomed to bathing in the sea can testify to this from painful experience. The disc-shaped body is of a very decided radiate type, being always divisible into 4 or 6 complete segments:—the long contractile threads which are placed on the edge and seem to be used as feelers, also obey this rule.

The nervous system and organs of sense are considered to reside in certain bodies which are imbedded in the edge of the disc, generally to the number of 6 or 8. They consist of some capsule-shaped little bladders, in which is contained a round or angular crystalline kernel. In some genera these little bladders are surrounded by a brightly coloured pigment, which has caused some observers to consider them as eyes, while others have thought them a rudimentary form of ear.

The digestive organs are formed in a very peculiar manner. The mouth is generally simple, sometimes surrounded only by a raised margin, but more frequently by seizing arms of the most varied shapes, which often possess raised margins, formed like a ruff. In some genera instead of one single mouth opening there are very fine sucking-apertures, which open either into a simple middle stalk, or into many feelers, which are again branched in their turn. Both the simple mouth and the fine pipes which lead up from these sucking apertures conduct into a larger or smaller stomach cavity, which generally possesses a certain number of sacks radiating from it. From these sacks spring a certain number of vessels which radiate towards the edge, and there disappear into one of the edge-vessels, or into an extremely delicate network of smaller vessels. In this manner the whole body is traversed by the nourishing fluid, and not seldom the remains of little animals are to be found in these canals, still undigested.

We cannot hope for a well grounded classification of the Medusæ until the connection between them and the Polypi is properly established; many different forms abound in all seas, but can now only be classed according to the normal number and arrangement of their organs.

The family of the "Mushroom-medusæ" (*Medusidæ*) has a roundish umbrella-shaped covering, with a four-sided mouth in the middle, which is surrounded by four seizing arms: indeed all the organs are arranged according to the number 4; the bodies on the edge, of which there are at least 8 of a brilliant red, and in young individuals are so clearly jagged outwards that they appear as if lying on cone-like extensions. To this family belong the "Ear-medusæ" (*Aurelia*) the "Sea-lamps" (*Pelagia*) see plate iv. fig. 1, and many other widely spread genera. *Medusa*, *Cyanea*, *Ephyra*, *Chrysaora.*

Very nearly related to this is the family of the "Sea-medusæ" (*Oceanidæ*) the organs of which are also arranged according to the number 4. The body is bill or hat-shaped; the mouth simple, and placed at the end of a long probosics; the threads attached to the disc are branched in some genera, in others simple. To this family belong nearly all those Medusæ which have been considered as direct descendants of the "Tube-polyps" (*Tubularidæ*) and have been called *Cladonema*, *Sthenyo*, *Callichora*, *&c.*, *Oceania*, *Thaumantias*, *Cytacis*, *Callirhoe.*

The family of the "Disc-medusæ" (*Aequoridæ*) has a flat lentil-shaped disc, with colourless bodies on the edge, and generally very short threads. The number 6 seems to reign amongst them; the mouth is uncommonly large and not surrounded by any seizing-arms. *Aequorea*, *Cunina*, *Eurybia*, *Aegina.*

The "Hair-medusæ" (*Berenicidæ*) have a flat bill with innumerable extremely fine hairs at the edge, through which very thin canals seem to rise upwards. In the disc itself only one vessel can be seen, resembling a branching cross, so that the number 4 seems to rule here. Apparently the nourishment is sucked in by means of the threads at the edge; at least no digestive organs have hitherto been discovered.

The family of the "Root-medusæ" (*Rhizostomidæ*) is better known than the preceding. Under a bell-shaped covering are seizing arms governed by the number 4, which are sometimes branched, and at the ends of which are sucking apertures which lead into a roomy stomach;—see fig. 2, plate iv. There is no mouth, and the vessels proceeding from the stomach form an elegant net-work at the edge of the bill. The bodies on the edge are of a bright red. Some genera of this family attain a diameter of several feet. *Rhizostoma*, *Cephea*, *Cassiopea*.

The family of the "Proboscis-medusæ" (*Geryonidæ*) has no mouth, but under its bell-shaped disc a very moveable massive stalk, in which rise six channels and open out into a six sided little stomach. The bodies on the edge are also arranged according to the number 6 and are colourless. The end of the proboscis, where we find the six sucking apertures is sometimes in folds, sometimes set with ciliæ;—see fig. 3, plate iv. *Geryonia*, *Favonia*, *Saphenia*, *Lymnorea*.

As almost the whole class of the Medusæ consists of soft gelatinous animals, we cannot expect to find their fossil remains, yet some confused impressions in the slates of Sohlenhofen seem to prove that the ancient seas were inhabited by Medusæ. The little trees also on which the bell-polyps are formed are too soft to have left any traces. In the present day both forms of the class are to be found in abundance in all seas, and are pursued by the *Ctenophoræ* by swimming snails which feed on them. The greater number shine by night with a trembling yellow light, which increases in brilliancy when they are in motion.

Class Siphonophora.

This class is a strange mixture of curious animals, merely being placed together in consequence of our extraordinary ignorance of their organization. In fact we do not know whether they are to be considered as simple animals with many sucking-apertures, or as a swimming polyp-stock, on which common stem a number of simple polyps are placed:—their anatomy is not understood, for neither their nervous system, nor organs for seeing, breathing or hearing have yet been found.

The family of the "Sea-bladders" (*Physalidæ*) commonly called Portuguese Men-of-War consists of a bladder-shaped body of gelatinous consistency, on the lower surface of which are a quantity of worm-like sucking apertures, feelers and very lengthy seizing-threads. The body consists generally of 2 bladders which envelop each other, the inner one being completely closed and filled with air, while the outer one has a comb at the top, which the animal uses as a sail when swimming. The outer gristly bladder is used too as a covering for the threads and feelers, which can draw themselves back into it: see fig. 4, plate v. Little bunches of red bodies are often found at the base of the sucking-tubes, and have been supposed to be eggs. These beautiful animals of a delicate pink and blue color swim in crowds on the surface of the southern ocean, and when touched can sting so severely that they were formerly considered poisonous. *Physalia*, *Discobale.*

The family of the "Gristle-medusæ" (*Velellidæ*) possesses a cellular disc of a gristly substance, sometimes containing calcareous deposits, and on the lower surface of which the bodily organs are placed;—see fig. 5, plate v. The cells of the disc are filled with air and thus give the body a certain specific lightness. In the middle of the lower surface of the disc is a large opening which some consider to be the mouth; around it are many small openings, also of a vermicular form, which some have considered to be feelers, and others sucking apertures. At the base of these are to be seen little clusters of small bodies the purpose of which is still doubtful. The animals of this family which are generally of a beautiful blue, appear at certain times in countless swarms in the Mediterranean, and in the ocean within the Tropics. The genus Velella, the only one in the Mediterranean, has a sharp upright comb on the disc, while the genus Porpita which inhabits the Southern seas has a simple round radiated cellular disc. *Velella*, *Porpita.*

The family of the "Double-medusæ" (*Diphyidæ*) consists of a number of more or less united beings, the structure of which is much more complicated than that of the preceding animals. There are to be found in the sea single bodies of a glassy transparency, which however consist of two pieces, a covering piece, and a flap-

ping swimming cavity which is generally shaped like a hollow bell, and is provided with an opening which is actively opened and shut: and the water streaming out of the swimming-bell drives the animal forward by its rebound. Under the covering piece there is a worm-like sucking body which in its extension shows a mouth of angular radiated form, at the base of which are hidden uncommonly long seizing and stinging threads.

It is still a question whether these animals, which principally form the genus Diphyes, are not detached pieces of one composite animal; for there are cases, where such creatures are these, are found in the sea to the number of forty or more, attached to one common stalk, at the upper end of which are two large swimming-bladders, each of which seems to contain an oil pustule:—see fig. 6, plate v. Each single animal can move independently, but the extremely contractile stem has also a proper motion, and the whole is drawn hither and thither through the water by the two large swimming bladders with great ease. The stem is hollow, and the nourishing fluid from the different animals circulates in its tube.

In other genera, for example Stephanomia, the union of the single animals is still more intimate. The swimming-bells are placed sometimes in rows, but more generally irregularly at the fore-end of the stalk, which contains an air-bladder. On the stalk itself are countless worm-like sucking apertures, each surrounded by a quantity of seizing and stinging threads. There is no more extraordinary spectacle than such a creature which swims in the sea with all its organs extended, like a transparent reddish plume of feathers about a span long, but when caught or touched the stalk draws up with an elastic impulse, and it transforms itself into a shapeless lump of jelly so that the tyro sorrowfully throws away his unfortunate prize. Is it a simple animal with swimming bells and sucking tubes, or a Polyp-stock adapted for swimming with various animals thrown swimming and eating? Further enquiries must give the answer to this question. *Physophora; Diphyes; Ersaea; Rhizophysa; Agalma; Hippopodius.*

ORDER MOLLUSCA.—The extremely numerous kingdom of the Mollusca is made up of such very different animals, that it is scarce-

ly possible to give any one characteristic distinctive of all. The separate classes indeed are sharply divided, and the whole kingdom is divided into two sub kingdoms which differ so much from each other that they ought rather each to form one kingdom.

In many Molluscs, the outer appendages of the body, the organs for moving, the feelers, &c., are symmetrically arranged, but this order is far from embracing the whole body, for the interior organs are often most unsymmetrically arranged. The nervous system is divided into two different types. In the Molluscoids we find but one knot of nerves, which stretches out its branches in all directions; in the Mollusca on the contrary, the nervous system consists of scattered knots, which are strewed rather irregularly over the body, and connected with each other by threads :—the arrangement of these knots is however so varied that we must take them in connection with each different order. The organs of the senses too are equally varied, sometimes wanting altogether, sometimes well-developed. Feelers are seldom to be found as the whole surface of the soft body is susceptible of outward imprcssions, yet there are sometimes lips, or flaps placed round the mouth, sometimes hairs or arms, and sometimes contractile feelers, all of which are evidently for the purpose of feeling. The seeing-apparatus is not developed in all ; in some there is found only one rudimentary eye while others possess a great number of incomplete eyes which are not even placed in the neighbourhood of the head ;—in the higher classes indeed, where there is but one pair of eyes which are placed in the head, they are developed to a very important degree. In the Molluscs we meet with hearing organs for the first time: they are round bladders, sometimes possessing a short but important hearing-nerve. Inside these bladders a clear fluid is to be found, and a firm concretion of carbonated lime, which sometimes forms one round hearing stone, sometimes many, which are crystalline: these seem to be kept in constant tremulous motion by ciliæ which clothe the inner surface of the bladder.

The skin of the molluscs is more or less leather-like, generally provided with a slimy slippery covering; in a few it is glassy clear and transparent; but in the greater number we find shells, which

are more or less developed according to every variety of type, and are very important in the classification of these animals.

Many Molluscs remain fixed to the ground except during their larval condition; others creep by an extraordinary organ woven out of muscular threads which is called a foot; many swim, some by sucking in water and then expelling it by a rapid contraction of the body; others by actual swimming organs which sometimes consist of rows of membranes covered with bristle like hairs, and sometimes of swimming-flaps, attached to various parts of the body.

The circulation of the blood is in a high state of development in most Molluscs, for they often possess a heart divided into several chambers, with both veins and arteries spreading though the whole body; but this as well as the breathing organs vary much in development in the different classes.

The greater number of Molluscs live in the water, the lower classes almost all in the sea, and it is only the higher classes which possess some genera living exclusively on land:—even these earth inhabitants however prefer damp swampy places and are destroyed by complete drought. The creeping genera prefer the lower surface of stones and water-plants, many bore into sand and still, even wood and limestone are not safe from their attacks. The actual swimmers all live in the sea, and are often met with on the open ocean.

The Molluscs belong to the first inhabitants of our earthly ball, and by the strength of their shells which have been preserved in large masses, have done great service to Geology. We shall only be able properly to consider their development in the different strata, when we have learned thoroughly to understand the peculiarities of the different classes and families.

SUB KINGDOM OF THE MOLLUSCOIDS.

The Molluscoids distinguish themselves by their very unsymmetrical form, and by only possessing one ganglion, which is generally connected with an eye-like organ placed immediately upon it. A separate head is never found amongst them, for even in those classes which like the "moss-animals" (*Bryozoa*) possess a mouth opening surrounded by feelers, there is never any division between

it and the rest of the body. In all other respects the three classes that compose the sub-circle of the Molluscoids differ altogether, so that we must consider their peculiarities in the respective classes, which are :—

1st. The "moss-animals" (*Bryozoa*) distinguished by their resemblance to polyps, their seizing arms and their social form ; a few genera inhabit fresh water.

2nd. The "Rib-medusæ" (*Ctenophora*) with rows of swimming in the water and jelly-like bodies ; these all live in the sea : and

3rd. The "Mantle-animals" (*Funicata*) of highly unsymmetrical build, enveloped in a broad mantle, and without peculiar organs of motion ; these all live in the sea.

Class Bryozoa.

These animals so much resemble polypi in their outward growth that they have often been confounded with them, but their internal structure will be found to be altogether different.

The Bryozoa are little polyp-like animals which form colonies, and are always surrounded by cells into which the animals can retreat, partially or entirely. The cells are sometimes horny or pliable like parchment, sometimes soft and jelly-like ; sometimes they stand on their own stalks which rise out of a network of tubes, which spreads itself by runners in the same way that many plants creep along the ground, but then rises and branches out. But in most cases and particularly in the sea Bryozoa the cells are of a calcareous nature, and then resemble the forms of many corals, possessing however hairs and horns which the coral-polyp never has. Moreover in some cases the Bryozoa cells are furnished with a covering which can be closed when the animal has retreated into its case ; and even when the cells are leathery, the fore-end can be contracted so as to enclose the animal completely.

In some of the genera living in the sea (*Cellularia*, *Bicellaria*, *Flustra* and *Telegraphina*) very strange organs have been discovered, the use of which is still quite unknown. They are seizing organs which look not unlike a bird's head :—see fig. 7, plate v., possessing a very strong upper and a very thin lower pincer.

These organs are in constant swinging motion like a pendulum, and the pincers are opened and shut from time to time which must be the result of a muscular action. Apparently these organs are analogous to the Pedicellaria of the Echinodermata, for like them, their motion continues after the death of the animal. In the genus Telegraphina, instead of these organs there are long stiff threads on the edge of the cell, which are also in constant swinging motion.

Eyes and ear-bladders are wanting altogether; the spots which in some genera have been taken for eyes, are not connected with vision.

In all the Bryozoa there is to be found at the upper end of the body a circle of actively moving seizing threads, each of which is hollow, and connected with the cavity of the inside of the body, and in which the fluid which fills the body is driven up and down. The seizing threads are set with delicate hairs, which by the eddies they occasion in the water drive the food, little animals, &c. towards the mouth which lies in the middle of the circle:—they may be useful also as a breathing apparatus, which would otherwise be quite wanting in the Bryozoa.

The polyp stocks of the Bryozoa, which are mostly very small and inconspicuous, are found in great numbers both in fresh and salt water, on all possible substances under waters. They are numerous too in the different strata of the earth especially in the purassic formation.

This class is divided according to the position of the feelers into 2 orders. In the "circle-whirlers" (*Stelmalopoda*) the feelers stand in a circle round the mouth; all the genera which belong to this order live in the sea. It is they alone that possess calcareous dwellings, and therefore are found in a fossil state. According to this and the arrangement of the cells, the order is divided into 4 families.

1st. The "Thousand-whirlers" (*Mitleporida*) which have calcareous, generally finger shaped branching polyp-stocks, in which the simple round cells are so confused, that at most a part of the upper opening appears free on the surface. These animals are

very little known, but seem to distinguish themselves principally by their long feelers. *Millepora*, *Retepora*.

2nd. The "Tube-whirlers" (*Tubuliporida*) which are also of a calcareous nature are nearly free, and only touch the common mass by their extreme end. They are now found in the Southern seas especially, and various genera of this family are to be found in a fossil state from the most remote periods. *Tubulipora*, *Cellularia*, *Crisia*, *Hornera*.

3rd. The "Crust-whirlers" (*Escharida*) are easily distinguished from the foregoing families as their round or egg-shaped cells can be completely closed by a moveable covering as soon as the animal is withdrawn. The genera which belong to this family are numerous both in our present seas and in a fossil state. *Eschara*, *Flustra*.

4th. The "Bell-whirlers" (*Lagunculida*) comprise all those Bryozoa which together with a crown of feelers possess a leather-like cell, and which are generally placed on long stalks on moveable root stocks. *Laguncula*, *Tendra*, *Bowerbankia*, *Holodactylus*.

The order of the "Arm-whirlers" (*Lophopoda*) inhabits fresh water.

Class Ctenophora.

The glassy transparent animals of more or less symmetrical form which belong to this class and are to be met with swimming in the sea, have been hitherto classed with the disc and the Tube-medusæ in a particular class of Medusæ (*Acalephae*) though besides their glassy transparency, they have not a trace of organization in common with them.

The "Rib-medusæ" (*Ctenophora*) are generally egg or cucumber-shaped, sometimes very broad with a mouth at one end of the body. The organs of motion and the vessels are generally so arranged that they appear like rags to an axis drawn from end to end, while the stomach and ganglious represent the bilateral type. In some the symmetrical type is still clearer as the body is drawn out sideways, even extending itself into a long oblique band in the middle of which the digestive organs are placed.

The skin of the Rib-medusæ is naked, and sometimes, like the Arm-polyps, furnished with holding organs out of which rises a

stiff little hair. These are only to be seen with the microscope, but there are also rib-like lines on the surface of the body, on which the swimming organs are placed. These consist of long stiff hairs placed in oblique lines, which are sometimes united at their base and are moved backwards and forwards in swimming singly and in union they depend altogether on the will of the animal. These swinging ribs scintillate with the motion of the animal in the most beautiful prismatic colours, and one may see clearly how the animal by oblique turns and twists sometimes uses this edge, sometimes that, leaving the others at rest. Thus these animals progress through the water with their slightly contractile bodies, without any other visible motion.

The digestive-apparatus of the Rib-medusæ is exceedingly simple. The mouth is to be found in the axis of the body, and leads immediately or by a longer contraction into a large cavity, the stomach, which in its turn contracts, and debouches by two side fissures into a funnel-shaped hollow, which is intended for taking in water. The mouth is generally furnished with very long, extremely contractile seizing threads, which are branched, and usually lie in peculiar sheaths inside the body where they are in constant worm-like motion. These threads are armed with organs both for stinging and poisoning which it appears that they use against their prey.

Above this funnel shaped cavity lies the simple ganglion, from which distinct branches radiate on all sides, and on which is placed a little bladder, in which a quantity of crystalline calcareous particles are kept in tremulous motion; we must therefore consider it as the rudiment of an ear-bladder. Other nerves and organs of the senses there are none. From the funnel-shaped cavity spring canals which run along the ribs of the swimming-flaps and show a tremulous motion in their inside;—these may be for leading in water, or they may be breathing organs, of which we otherwise discover not a trace.

The organization of these animals which are to be found in numbers in every sea is so uniform that there is no need to divide them into different orders. We distinguish two families:—

1st. The "Gerkin-medusæ" (*Beroida*) have generally an egg-shaped or round body, with a large mouth, a wide stomach-cavity, and 8 rows of swimming-membranes which run in regular lines along the body. See fig. 8, plate v. They are very agile and voracious animals pursuing other medusæ in particular. *Beroe*, *Leseuria*, *Medea*.

2nd. The "Band-medusæ" (*Callianirida*) possess but a very small mouth opening, and an extremely narrow stomach, but they very often have seizing arms and side flaps, on which the swimming-membranes are arranged. To this family belongs the well-known Girdle of Venus (*Cestum Veneris*) a band about the width of three fingers, from four to five feet long, with a narrow mouth in the middle of the beautifully iridenent band. See fig. 9, plate v. *Cestum*, *Callianira*, *Alcinoe*, *Cydippe*, *Eucharis*, *Mnemia*.

From the gelatinous substance of these animals it is no wonder that we cannot be certain of any fossil remains of them.

Class Tunicata.

The animals form this class distinguish themselves from all others by their highly unsymmetrical build. In the greater number of families it is a simple impossibility to recognize a middle line or axes round which the organs are placed in any regular form; it is only in the higher families that a lateral arrangement can be perceived, and these not very distinctly. The bodies of the animals are generally irregularly cylindrical, egg or wart shaped, without any exterior sign of division into different parts.

The outer covering of the body always consists of a loose skin, which is more or less tough, and encloses the whole body like a bag and possesses only two openings, one for the ingress of food and water, the other for the exit of the same. This mantle, which is sometimes gristly, sometimes like jelly or leather, is for the greater part of its mass composed of true woody fibre or *Cellulose*, which does not dissolve in acids or alkalis, and forms the hard constituent part of plants. The inner structure of this mantle has been thoroughly examined; it consists principally of clear foundation, substance in which not only fibres and cells are to be found, but often variously formed crystalline aggregations of carbonated lime.

In the case of the sea-sheats which are social the outer mantle of of the various individuals, unites so that a common jelly-like covering is formed, in which the separate animals are placed and from which they can easily be freed.

Some of the Tunicata live either in colonies or separately each are attached to the ground; in this case their only activity is confined to a lazy opening and closing of the openings in their mantle. The free-livers can swim, and perform the feat in this remarkable manner :—they suck in water with great activity, and then ejecting it with equal force, the backstroke of the gushing water drives them forward. In those cases where individuals are united in chains all swallow and eject water simultaneously and in the Pyrosomidœ where many individuals are united in one swimming mantle, the mantle itself moves them on.

The nervous system of the Tunicata consists of but one large ganglion which is to be found on the back surface near the ingress opening. In the Salpœ this ganglion, which is kettle-shaped, bears on it the single eye, which is generally surrounded by a dark red pigment. Other organs of the senses are completely wanting.

The circulation of the blood is most clearly developed, and the motion of it is always carried on by a bag-shaped heart which is either placed near the breathing organs or at the bottom of the body: from this heart are expelled streams of blood, which either run in canals, or spread themselves in the interstices between the organs. But the peculiar and remarkable circumstance is that in all the Tunicata the direction of the stream of blood changes periodically. The heart makes a certain number of pulsations in one direction, then it stands still suddenly, and recommences its pulsations in the other direction. So it varies at irregular intervals, often of several minutes, and in all the vessels one sees the blood change, streaming first from left to right, then stop, and then take the contrary direction. In the transparent Tunicata one can easily convince oneself that these changes originate solely in the heart :—one cannot therefore speak of veins and arteries as the direction of the circulation is constantly changing.

The breathing-apparatus is highly developed according to two different types. In the Ascidiæ the water enters through the

opening in the mantle into a large gill-bag, the whole inner surface of which is covered by a lattice work of oblique meshes, each mesh being furnished with ciliæ in constant motion. The eddy occasioned by these ciliæ draws the water through the outer opening into the gills. Each mesh forms a slit through which the water flows outwards, and it is then thrown out through the other opening in the mantle. In the case of the Salpœ on the contrary, the gill-bag forms the greater part of the body, and the gills have the appearance of crooked beams stretched out from above to below and from end to end of the bag. The wall of the gill-bag is completely smooth, but each beam is full of a great number of vessels. The water is swallowed in at the fore-end, winds round the gills, and is then expelled at the hinder end.

The order of the Ascidiæ consists of extremely unsymmetrical animals, the two openings in the mantle of which are generally very near each other, and attach themselves in jelly-like lumps to rocks and sea-weed; it consists of four families :—

1st. Ascidiæ compositæ.
2nd. Ascidiæ sociales.
3rd. Ascidiæ simplices.

4th. The "Fire-cones" (*Pyrosomida*) which form a kind of link between the composite Ascidiæ and the following order. One finds swimming in quantities in the Southern seas, jelly-like bodies, sometimes a foot long, which are rather of the shape of a fir-cone, and show a large internal cavity which possesses a circular opening at the broad end. The cone swims slowly with changing contractions, by which it expresses the water from its inside. By night it shines with a clear splendour like iron at a white heat. The light begins at a small point and spreads trembling over the surface of the cone till the whole is in a glow. When such a cone is narrowly examined it is found to be the common mantle for a number of animals much like the Ascidiæ; they approach them in the structure of their gill-bag and in their mode of propagation, but their distinct eye on the large ganglion, their power of swimming, their phosphorescent nucleus and the position of the openings in the mantle proclaim their affinity with the Salpœ.

The order of the "Cylinder-sheaths" or Salpœ (*Biphora*) embraces swimming animals of glassy transparency which are particularly numerous in warm seas. The greater part of the body is formed of a gill-bag, often furnished with extraordinary points and appendages :—it clearly consists of an outer and an inner covering, in which are placed bundles, or oblique bands of muscular fibres. The digestive organs and the heart are pressed together into a little round ball which has been called the kernel or nucleus :—this is generally red or yellow, seldom blue, and shines by night with a lively reddish-yellow lustre. At the fore-end of the cylinder-shaped body is an oblique opening surrounded by moveable lips which leads into the wide gill-bay. The ganglion with its nerves radiating in all directions is very distinct, as is also the eye surrounded by a dark brownish red colouring matter which is placed on it. On the lower side of the gill-bag there is a groove set with ciliæ, and a wrinkle also ciliated near the mouth, the uses of which are not yet known.

The Biphora are found swimming in various social stages. Generally they form chains, in such a manner that long rows of individuals are attached to each other by the pointed prolongations of their bodies or by their sides, so that one sees a long band swimming in the sea, set with a quantity of red nuclei in alternate rows. All the animals inhale and exhale water at the same time and thus the chain progresses. An animal which is once separated from the chain (see fig. 10, plate vi.) cannot unite itself to it again, for it clings to its companions only by hardened slime. There are however Salpœ which never form into chains under any circumstances, and which do not agree in their form with the chained individuals. They were formerly considered to be of a different kind, but modern investigations have proved that chained and single individuals, however they may differ in their outward appearance, are all of one and the same kind in different stages of development. In all the Biphora there is to be found in the neighbourhood of the heart a kind of knot or cone, in which a strong stream of blood rises and falls, and which at first looks very unimportant. After some time one may see on this cone little wart-like protuberances, which grow by degrees till they form a circle of embryos placed round the cone.

This budding-cone is extremely productive, as one may often see three or four rows of embryos in different stages thus coiled round it, which when they have reached their proper size, separate themselves from it, and swim away as a chain.

These single individuals are very rarely to be met with without a chain of embryos round their cone, but here a most remarkable circumstance comes in;—during the time when the chained animals are still in an undeveloped condition round the cone, an egg is formed on their surface which grows by degrees till it projects into the gill-bag, and after a time becomes a separate individual, though its stages of development have not been regularly traced. This formation of an egg in an animal itself undeveloped, has something in it most mysterious.

However it may be it is certain that every kind of Salpœ consists both of chained and of single animals; and that the single individuals produce rows of Salpœ, while the chained individuals produce one each which remains solitary during its whole life.

There is but one family *Salpœ*, though several genera are probably yet to be discovered in it.

There are no fossil representatives of the whole class of the Tunicata.

Sub kingdom of the Mollusca.

Class of the Cephalophora.

Sub-class of the Pteropoda.

This sub-class consists of a few and insufficiently-known Molluscs, which all distinguish themselves by wing-like projections on the head which were at first supposed to be gills, but are really only swimming organs composed of an endless number of crossed muscular bundles. These little animals support themselves on the surface of the sea by these swimming-flaps, and are very seldom driven by accident into the neighbourhood of the shore. They are all nocturnal animals, rising with the twilight in countless swarms out of the depths of the sea, and sinking down again with the morning light. The whole of the day not a brace of them is to be

seen, and many kinds come to the surface only on the darkest nights. Their swimming flaps are in constant swinging motion like the wings of a butterfly, but at the slightest danger they draw them in, and sink back into the dark abyss. The greater number of them possess a very thin horny shell which encloses the whole body of the animal, except the mouth and the swimming flaps. Some of them are quite naked and then they have a firmer skin.

These animals show the low grade of their organization in all their organs without exception. The greater number have no regular head and therefore neither feelers nor eyes :—only two genera possess eyes, in the others they are altogether wanting, though hearing organs are pretty generally developed. The mouth is generally unarmed, often surrounded by short prolongations which sometimes bear sucking cups. Their anatomy and development are so little known that we cannot arrange this sub-class property into orders.

We distinguish two families. The " Crystal-snails" (*Hyalida*) possess a shell, sometimes spindle, sometimes shoe-shaped, sometimes spiral, and of extreme tenuity and bitterness, which causes it to fetch a very high price with collectors :—feelers and eyes are altogether wanting and no distinct head is to be perceived: see fig. 11, plate vi. The mouth is to be found between the two swimming-flaps, which stand horizontally on each side, and can generally be drawn back into the shell. They live in all seas, rising to the surface in swarms in the evening. Shells belonging to this family have been found in the Tertiary strata, but whether the so-called concelarias which are to be met with in great numbers in the transition formation really belong to this family is very doubtful. *Hyalea, Limacina, Cymbulia, Cleodora, Eurybia.*

The family of the " whale-snails" (*Clioida*) is divided from the former by the want of a shell, the possession of a distinct head generally of feelers and in one genera of eyes. Those which abound in the North South Polar seas, form a principal part of the food of the whale, and as the whole little animal is scarcely an inch long, it may readily be imagined what enormous masses of them are required to feed their gigantic enemy. *Clio, Pneumoderma.*

Sub Class of the Heteropoda.

This sub-class comprises a few swimming animals with spindle-shaped bodies, which are glass-like and transparent, and sometimes possess a pretty little shell, which however contains but a very small part of the body. The swimming apparatus consists of a keel-shaped float or fin, which is turned upwards when the animal swims. The head is distinct, and provided with feelers more or less well formed, and generally possesses two large eyes and a long proboscis, at the fore-end of which the prickly tongue is rolled up.

We distinguish three families :

1st. The "Atlantides" (*Atlantida*) possess a snail-like shell into which the animal can withdraw completely. The head is provided with feelers, eyes and a short proboscis, and is placed on an elongated neck, on the lower side of which are placed the swimming flaps provided with a sucking cup; and a tongue shaped prolongation bearing a thin legument which closes the opening of the shell when the animal is entirely withdrawn. *Atlanta.*

2nd. The family of the "Keel-snails" (*Firolida*) is either entirely naked, or has a little cap-shaped shell. The body is sometimes as much as a foot long, spindle shaped and so transparent that in a perfect specimen all the peculiarities of the organisation can be clearly traced. These animals appear in swarms on the surface of the Mediterranean but their shell is so brittle that it is seldom obtained perfect. *Carinaria, Pirola, Pterotrachea.*

3rd. The family of the "Arrow-snails" (*Sagittida*) is only placed provisionally in this sub-class :—it consists of little spindle-shaped animals with a distinct head which have hitherto only been found in the Mediterranean and North seas. (See fig. 12, plate vi). At the sides of the body are two pair of horizontal swimming flaps, and the tail end is surrounded by a swimming flap, shaped something like the feathered end of an arrow. The mouth is armed with lateral hook-mandibles, and on the head are two slightly developed eyes and feelers. The activity with which this animal moves is remarkable. *Sagitta.*

NOTES AND QUERIES.

We announced in our last number, vide Vol. 3, page 266, that it was intended under the above head to afford an opportunity to all persons of soliciting, or affording, information of a literary or scientific character, or with reference to subjects of peculiar interest in this country. As we have reason to believe that the proposed plan and rules regarding it are not sufficiently known, we reproduce them here for general information: and we trust that many of our Correspondents will favor us with materials for the regular continuance of this department of the Journal.

It is proposed that all Notes and Queries are to be numbered consecutively from the commencement, in order to facilitate more easy reference hereafter.

The following rules are to be adopted with reference to the subjects of enquiry and the method of authenticating communications.

(1). Notes and Queries submitted by Correspondents should be confined to those of a scientific and literary character; the queries should be put, and the answers given in the plainest and most concise form. As several communications will frequently be sent in answer to the same query, the *substance only* of these will be given; except where the answers differ in material points, when the opinions of each writer will be recorded.

(2). Correspondents in forwarding Notes or Queries should authenticate their letters, not only for the satisfaction of the Committee, but chiefly as a means of communicating with the writer should further enquiry be necessary. The name of the Correspondent will be appended to his first communication, and his initials to all subsequent notes, &c.

We purpose submitting in our next number a series of queries for reply. And we hope, on that occasion, also to give answers to some of the queries (1 to 7) before proposed. To one of these we now insert a reply, for which we are indebted to the kindness of Professor Mayer.

" *Query* No. 5. A peculiar concretion resembling lime or gypsum is occasionally found in the heart of teak logs. It generally collects in what carpenters call a " shake" in the wood, but with this exception the logs are perfectly sound, and no communication whatever with the external air has been observed. Is its chemical constitution the same as that of the " tabasheer" or bamboo salt. (Mr. Hawkes).

Reply by J. E. MAYER, ESQ., *Professor of Chemistry Madras Medical College.*

IN answer to the foregoing I beg to submit the following report of an examination of a Calcareous found in the rift of a log of Teakwood.

The Chemical composition of the white incrustation enveloping what has been ascertained to be woody fibre is the following.

Bases.	*Acids.*
Iron.	Carbonic.
Lime.	Silicic.
Magnesia.	Phosphoric?
Potash.	Scarcely perceptible trace.

The examination not having been quantitative, the expressions employed to indicate quantities are merely approximative and comparative. Thus the base present in largest amount is certainly magnesia, but the percentage though probably exceeding 50 parts of the whole can only be thus suggested in like manner silicic acid, is in considerable amount while the carbonic acid is in small quantity, and the phosphoric in an inappreciable one, reverting to the remaining bases, iron, is present in small amount, so is lime, potash in somewhat *larger* quantity.

The substance formed by the bases and acids above specified, may be regarded as a natural kind of calcareous cement, not very dissimilar to our mortars except that it possesses a larger amount of silicic acid in a soluble form. The substance as a whole must be looked on a mixture, and not a true chemical compound, though containing such compounds, viz. carbonates and silicates of magnesia and lime and potash of which indeed the substance

is almost entirely composed, the iron being casually present and the excess of base being due to the gradual liberation of carbonic acid, occasioned by the act of deposition and the presence of silicic acid in a soluble form. The solubility of the alkaline earths is due to excess of carbonic acid which as it is liberated leaves the silicates of potash and magnesia with some carbonate and iron, in the plastic form, at first, but becoming hard with lime.

As a whole the substance thus hardened is insoluble in cold, and but slightly so in water of higher temp. At 212°, however, there is sensible action after a time. In diluted hydrochloric acid, solubility ensues hastened by increased temp. Solution is attended by slight effervescence, some carbonic acid being liberated.

The natural processes by which the changes just noticed are brought about are probably the following.

Water from rivulets, mountain torrents or streams always contains some carbonic acid, although it may be a mere trace, or a considerable quantity. This being mainly dependent on the amount of vegetable matter, leaves, woody fibre, &c., over which it has traversed, thus impregnated, the water becomes a powerful solvent of alkaline earths, and other matters presented to it, in its course through, or ever the various striata of the earth, and in this way we find it holding silica alkalies, lime and magnesia as well as iron in solution, chiefly in the form of *bi-carbonates* after water has thus become a means of dissolving the substances named and subsequently a mechanical agent for their transport from one locality to another. It remains but to show under what conditions the substances dissolved are again deposited. These are numerous and various, but to make them fully appreciated it will perhaps be the simplest course to refer to a broad principle universally acknowledged and established. I allude to the degree of force with which atoms are held in combination and especially to the difference in force by which a second atom of similar nature to the primary one combined, is retained, thus as an illustration we may take one atom of an earthy base or oxide, which may be Lime—*i. e.* oxide of calcium, now if this atom of base meet with an atom of carbonic acid, they will directly combine forming one atom of the salt we commonly term chalk or more correctly carbonate of lime,

and the atom of base will hold this atom of acid with very considerable force, in fact nothing short of a stronger chemical affinity or a high degree of temperature, can separate this atom of acid from the atom of base, the case however is very different should the salt carbonate of lime combine with a second atom of carbonic acid, so as to become a bi-carbonate of lime, since instead of holding the second atom of carbonic acid with a degree of force equal to that with which the first atom is held, the force is so feeble, that it is liable to be overcome by the slightest change of circumstances, mere evaporation of the watery particles of the fluid in which the bi-carbonate may be is sufficient to cause the separation of the second atom of carbonic acid, and consequently to determine the deposition of the carbonate. The solvent for the carbonate being the second atom of carbonic acid, and as soon as this is evolved there is nothing to prevent the carbonate from returning to its insoluble state and it does so accordingly. In the instance of the substance sent to me for examination, the deposition has been effected by the attraction of a solid causing the liberation of carbonic acid gas. The action, however, in this particular case, does not stop here,—the deposit is continually washed by water containing soluble silicic acid and soluble silicates, these are continually causing a further elimination of carbonic acid; silicates of alkalies and alkaline earths being formed, while the carbonic acid set free either escapes into the atmosphere, or as the case may be seizes any portions of free alkali at hand. It is a familiar fact that when water is artificially impregnated by carbonic acid mere exposure with diminished pressure, allows of the escape of this gas, the escape is more rapid, if the water be poured or allowed to flow, while in contact with the atmosphere and relieved from abnormal pressure. Still more rapid is the effect, if water whether naturally or artificially impregnated with carbonic acid be boiled, and in this last case, if the alkaline earths or iron be in the soluble form as bi-carbonates, they are (during the ebulition) precipitated in the form of carbonates to the bottom of flask or other vessel in which the carbonated water was held. Finally if either naturally or artificially the water is kept under pressure, and the source of the carbonic acid is continually pre-

sent, the water becomes highly impregnated with it, of which fact, the process of soda-water making is a well known illustration; and of the effect of such conditions, where alkaline earths are present, Sir James Murray's *fluid magnesia* and the *fluid carara marble* of several patentees, are again familiar instances. In the formation of these and similar preparations, we do but imitate the beautiful operations of the highest intelligence as seen in the great Laboratory of the world. When streams impregnated strongly with carbonic acid, are confined beneath the surface of the earth, under pressure while at the same time, the walls of the space through which the imprisoned waters flow afford the alkaline earth's silica, &c., taken up and thus produce carbonated waters, petrifying waters, &c., &c., (when the abnormal pressure is removed) according to the nature and quantity of the solids which have been taken up and for a time held in solution. How slight a cause will occasion such waters to deposit a portion of the solids held in solution is evident from the families practice of suspending keys, knives, or indeed any solid into petrifying wells, as they are popularly termed, all which after having remained in these waters for a longer or shorter term, come out incrusted with deposits more or less calcareous or silicious according to the character of the water. In the case of the deposit before us, the solid on which it has occurred, has been proved to be a portion of woody fibre separated probably from the part to which it originally belonged, by the combined effects of moisture, drying unequally, and consequent unequal expansion.

J. E. MAYER.

OBITUARY.

J. Forbes Royle, M. D., F. R. S.

THIS distinguished Botanist died on the 2nd January 1858, at his residence, Acton. He had been unwell for several weeks previously, but his death was sudden at last.

Dr. Royle commenced his career as a pupil of Dr. Anthony Todd Thompson, and was appointed Medical Officer in the Honorable East India Company's Service on the Bengal establishment in 1820, and performed military duty till 1823.

While so employed, Dr. Royle turned his attention to the vegetable products of this vast empire, and having distinguished himself by an accurate acquaintance with Botanic Science in general, he was chosen as the superintendent of the Botanic Garden established by the Government of Sahrempore, at the foot of the Himalayas, a position which gave him the best opportunity of studying the indigenous flora of Hindostan.

Here, under his direction, a number of most important inquiries were carried on, especially with respect to the feasibility of introducing into the more temperate districts of North India, the cultivation of the Chinese tea plant, &c.

In 1832 having spent 12 years in India, he returned to England, that he might publish the results of his investigations.

The "Illustrations of the Botany of the Himalaya Mountains" forms his earliest and most voluminous printed work. It is in two folio volumes, illustrated by coloured plates and was reviewed at length in the 1st volume of this Journal (1834).

Dr. Royle as Secretary for the correspondence relating to the vegetable productions of India (at the East India House) continued to prosecute these enquiries, directing them with vigour and zeal. In this sphere of research Dr. Royle has been worthily succeeded by Dr. J. D. Hooker and Dr. Forbes Watson, and his schemes for the introduction of tea into India have been carried into a most successful practical result, partly by the labours of the enterprising traveller, Mr. Fortune, partly by the able direction of Dr. Jameson, the laborious superintendent of the Tea Farms. Black and green tea are now grown in the Kumaon district, and prepared by Chinese obtained for the purpose. This tea, we believe, is considered quite equal to the best samples of Chinese tea, which, it may one day supersede.

On the question of Cotton cultivation in India, Dr. Royle has

contributed an admirable digest which contains all the information that can be given.

Of late, the materials for the manufacture of paper having become scarce in England, much anxiety was felt as to the substitution of other fibrous material that might be used instead of the linen rags. Dr. Royle in an Essay read before the Society of Arts on the Fibrous Products of India, pointed out that many indigenous plants produced fibres that could be obtained very cheaply, and in almost any quantity. No man has in fact, contributed more to the practical application of Botanic Science, too often a mere closet study, than this lamented Physician, whom we may well regard as an ornament to his profession, being assured that his name will go down in history as that of a benefactor of his species. This language will not seem exaggerated when we consider the vast importance of the inquiries in which he so successfully engaged. With the cultivation of Cotton is connected the question of the American Slave Trade, and the maintenance of our prosperity as a manufacturing people. The production of Tea is a matter of universal interest.

The cheap manufacture of paper is a matter of such world wide importance that it need not be insisted on. Some few years after the establishment of King's College, London, Dr. Royle was called to fill the important office of Professor of Materia Medica elected in 1836, he occupied this chair for twenty years. The weight of his name contributed to raise that institution to the prominent position which it has since held.

In 1837 he published an Essay " On the Antiquity of Hindu Medicine" a work displaying much learning and research.

His extensive knowledge of the Natural History of India made him a valuable contributor to the periodical scientific literature, and he was a contributor to the " Penny Cyclopædia," " Kitto's Dictionary of the Bible" and other works. He took an active interest in promoting a knowledge of the material resources of India, and in 1840 produced a work which perhaps will be read with more interest now than when it was published. " On the Productive Resources of India."

At the Universal Exhibitions of 1851, as well as that of 1855 in Paris, Dr. Royle represented the East India Company, and was engaged in arranging the department of each building that was allotted to India. He evinced the same interest in the Exhibitions of this Presidency, and some valuable " observations on the improvement of the resources of the several districts" will be found in the 18th Vol. of this Journal, p. 64, 1857.

The materials collected at the different Exhibitions are now preserved in a capacious museum, built for the purpose in the premises of Leadenhall Street. Within a few days of his decease, Dr. Royle was actively engaged in the arduous work of classification. These duties occupied so much of his time that he had less opportunity to attend to the labours of his Professorship. During the last two years that he retained this office, his friend Dr. Headland lectured in his stead; and it was not until 1856 that Dr. Royle resigned. He also made use of Dr. Headland in some of his literary labours. He committed to his supervision the editions of his " Manual of Materia Medica," which is much valued by students.

For a short time he held the office of Secretary to the British Association for the advancement of science. He took an active interest in the development of the plan of the great Exhibition of 1851, and the success which attended the Exhibition of the department of Indian Products was due in a great measure to his efforts. He was a fellow of the Royal, Linnæan and Geological Societies, and at the time of his death held an appointment in connection with the East India Company in London. A subscription is on foot to place a bust of him in the Hall of King's College, London.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

[Under the title of "*Proceedings*" it has been hitherto our custom to publish the abstract of those of the Madras Literary Society, but, as it is desirable to have grouped together in one volume on account of the business of the various Scientific Societies at the Presidency, we have determined to include, under the title above, such details, as to all of them, as may be deemed worthy of permanent record. The Literary Society, the Agri-Horticultural Society and the Photographic Society will thus, all together, find a place in our Journal, and we trust that the record of their Proceedings may be both interesting and instructive.]—ED. M. J. L. S.

The Managing Committee of the MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, on Thursday evening, 8th April* 1858.

The usual statement of the Society's Funds was read and passed.

Mr. Breeks having quitted Madras, Major W. J. Wilson, and H. B. Montgomery, Esq., M. D., were elected Joint Secretaries—the latter to have charge of the Department connected with the Journal.

A letter dated 15th March 1858 from a subscriber at Ongole was read, this letter points out an apparent error in Lieut. Hawkes' Paper on Oils published in the last Number of the Journal. A reference was made to Mr. Hawkes, who requests that the Table of Exports at page 56 may be corrected by the omission of several redundant figures which have crept in after the correction of the proof.

The necessary correction will be made in the Table of Errata in the forthcoming Number of the Journal.*

The following letter from Dr. Cornish, Civil Surgeon at Coimbatore was also read.

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* Vide Table of Errata in No. V. Vol. III.

COIMBATORE, 17*th March*, 1858.

To the Editor of the Madras Journal of Literature and Science.

SIR,—I have just perused with much pleasure in the last Number of your Journal, an interesting description of the crystalline limestone of Coimbatore, by H. F. Blanford, Esq., of the Geological Survey of India. Mr. Blanford's introductory remarks would lead to the supposition that the discovery of the formation in question had been made, in the first instance, by Dr. Cleghorn and Captain Francis, the District Engineer, but such was not really the case. The credit of the discovery, if there be any, belongs to A. D. Ross, Esq., Engineer No. 1 District, Madras Railway and myself.

Early in June 1857, Mr. Ross happened to mention to me that the Natives employed on the Railway were in the habit of burning a curious looking stone in the neighbourhood, for chunam to mix with their betel nut, and, at my request, Mr. Ross was good enough to procure me a specimen of the stone, which I at once recognised as a crystalline marble.

A few days after this I examined the locality where the stone was found, accompanied by Mr. Ross. We traced the band of crystalline limestone from the point stated by Mr. Blanford to the edge of the Walior jungle, a distance of seven or eight miles, and on Mr. Blanford's subsequent visit here I accompanied him and pointed out the position of the limestone band.

Dr. Cleghorn and Captain Francis some weeks after my examination accompanied Mr. Ross along the Railway works to the Walior jungles, and the limestone in question was then pointed out to them, in situ, by Mr. Ross.

At the time of discovery specimens of the marbles were submitted by me to the inspection of the Collector E. B. Thomas, Esq., and Captain Francis.

In justice to Mr. Ross and myself I mention these particulars; Mr. Blanford was doubtless unacquainted with them, or, as he attaches so much importance to the discovery, I am sure he would have given us the credit of being the first to recognize the value of the limestone.

It was my intention at the time to have written a short description of the discovery, but Mr. Blanford's subsequent visit to the neighbourhood led me to abandon the plan, as I felt certain that his account would be in every way more trustworthy than mine, from inexperience in geological description could be.

It is a curious circumstance that a prominent rock of this nature should have been passed by, for so many years unobserved. The Natives knew it practically as a limestone, from the fact of their using it for betel chunam, but none of the European residents, past or present, seem to have had the faintest idea that marble quarries of unlimited extent were to be found within 4 miles of Coimbatore, and within 300 yards of the Madras Railway.

Mr. Ross had been using the stone largely for piers and abutments of bridges on the line of Railway previous to my superficial survey of the locality and before he had asked my opinion as to its nature and composition.

Mr. Ross stated that the Masons were much pleased with the stone ; it was easily quarried and the labor of pointing it contrasted very favorably with that of the gneiss and schistose rocks in the neighbourhood.

I can corroborate all that Mr. Blanford has stated as to the economic value of this crystalline limestone. I fear however, from the coarse crystallization of its structure that it will be difficult to work it for polished slabs.

My friend H. E. Sullivan, Esq. has attempted to polish a few specimens, but it does not work very smoothly.

I am in hopes however that a finer grained stone may be found on careful examination.

On my first visit to the locality I picked up a fragment of white marble, totally differing from the common pink and grey varieties described by Mr. Blanford.

It was very compact, and dense in structure, resembling pure statuary marble, only that it had coursing through it greenish veins of some talcy mineral. I have not been able to meet with this variety since, but it is doubtless to be found on more careful investigation.

This was the most promising of any specimen, and appeared to be admirably suited for ornamental work requiring a high polish.

In conclusion, I may mention that since Mr. Blanford's visit to this neighbourhood, a continuation of this limestone band has been observed by my friend Mr. Ross, some miles to the West of Paulghaut, in a railway cutting.

I am, Sir,

Your obedient servant,

(Signed) W. R. Cornish,

Civil Surgeon.

Mr. Elliot observed that he had received a letter from Dr. Cleghorn within the last few days in which the justice of Mr. Cornish's claim in behalf of himself and Mr. Ross to the first discovery of the limestone was fully admitted, Dr. C. having merely sent the specimens of the rock pointed out to him by Mr. Ross to Mr. Blanford with a view of attracting his attention to the subject.

Mr. Elliot brought a paper on the Syrian and Jewish copper plates of Malabar referring to the previous discussions on these documents in a former Volume of the Journal, and which had been forwarded to him by Mr Collett, from Kokel Kelloo Nair, Moonsiff of Calicut. This paper takes a view differing in many respects from the interpretation of former writers on the subject and assigns to the Plates a date considerably earlier than they have hitherto supposed to be entitled to, founded on certain astronomical data contained in the documents themselves.

The paper is very remarkable as the production of an intelligent and well informed native gentlemen who has had few advantages for acquiring an English education, and who has entered on the subject in the spirit of European criticism. It was referred to the Committee of Papers.

A Vocabulary of the Kotars of the Neilgherry Hills was also read, it is the production of the Revd. F. Metz, whose Toda Vocabulary has already appeared in the pages of the Journal.

The Committee acknowledge with thanks the receipt of the following books.

From the Chief Secretary.

Memorandum on the Pauchontee or Indian Gutta Tree, by Dr. H. F. Cleghorn.

Translation of Dr. W. C. Maclean's Hindustani paper on Small Pox, by Dr. J. Shortt.

From the Author.

Hir et Ranjhan, Legende de Penjab, par Monsieur Garcin de Tassy.

At a Meeting of the Managing Committee of the MADRAS LITERARY SOCIETY, *and Auxiliary of the Royal Asiatic Society held at the Club House, on Thursday the* 13*th May* 1858, *at* $\frac{3}{4}$ *past* 6 *o'clock*, P. M.

PRESENT.

The Hon'ble Walter Elliott, Esq., *Chairman.*

E. Maltby, Esq.	W. C. Maclean, Esq., M. D.
R. Burgass, Esq.	M. Norman, Esq.
Captain G. Winscom.	W. J. Wilson, Esq., *Secretary.*
H. B. Montgomery, Esq., M. D.	

The Secretary laid before the Meeting the usual monthly statement of the Society's Funds prepared up to the 13th Instant.

Resolved, that the foregoing statement is satisfactory and be passed.

Read the following Extract from Minutes of Consultation.

No. 539.

Public Department.

Extract from the Minutes of Consultation under date the 6th May 1858.

Read the following letter from W. J. Wilson, Esq., Secretary to the Madras Literary Society, to the Chief Secretary to Government, Fort Saint George, dated 1st May, 1858.

SIR,—I am directed by the Chairman and Managing Committee of the Madras Literary Society to forward an Extract from a letter to the address of the Honorable Mr. Elliot, from the Messrs. Schlagentweit of Berlin, and to say, that they consider the proposition

therein contained to be one in every way deserving the consideration of Government.

I have also the honor to forward herewith a specimen of a Santal Head, the execution of which is excellent and highly characteristic, and to observe that the cost compared with the value and interest attaching to such a collection is very moderate; the whole outlay on the 250 heads probably not much exceeding two thousand Rupees.

Extract.

Our collections are now at Berlin where, with the Court's consent, they were brought for being examined and filled up.

A complete set will then be returned to England; the rest is to form a special Indian Museum here. As one of the materials which may perhaps be of some special interest to you, I mention our collection of Ethnographical heads about 250, which are made in copper by galvano plastic, and which have been particularly well received by Baron Humboldt.

If you should find it proper, I would request you to propose to the Government of Madras to order a set for your Museum.

The Government will take one set of the collection of Ethnographical heads made by Messrs. Schlagentweit, for the Madras Central Museum, if the Madras Literary Society will obligingly arrange for getting them out.

(True Extract and Copies.)

(Signed) T. Pycroft,

Chief Secretary.

Resolved, that the decision of Government be communicated to the Messrs. Schlagentweit by the Secretary, Mr. Elliot also announced his intention of writing to these gentlemen respecting the arrangements for the transmission of the heads.

Read letter from Mr. Bayley regretting that he had been unable from indisposition to submit his report on the system proposed by the Messrs. Schlagentweit for rendering the Indian vernaculars into Roman characters which had been referred to him, and sug-

gesting that a Committee should be appointed to consider the general subject.

Resolved, that the Honorable Mr. Elliot and Messrs. Bayley and Norman do form a Committee to report on a uniform system of rendering into Roman characters the Hindostanee, Tamil and Teloogoo vernaculars.

Read a letter from Mr. H. F. Blanford submitted through Mr. Brooke Cunliffe, forwarding a memorandum on the geological age of the sandstones containing fossil wood at Trivikeri near Pondicherry.

The country around Trivikeri consists of a coarse sandstone containing the well known remains of large trunks of fossil trees, to the westward of which the primitive gneiss formation of the Peninsula appears, and to the east extensive cretaceous beds with numerous remains of ammonites and other chambered shells which stretch for some distance towards the sea, after which the sandstone again appears and continues until covered by the alluvial formation of the valley of the Tembakam-nala which reaches to the sea-shore at Pondicherry.

It has hitherto been supposed that the cretaceous beds rested upon the sandstone formation, and where the latter was wanting directly on the gneiss, and this opinion has been maintained by Mr. Heslop in the geological transactions, and by Mr. A. Schlagentweit in one of his memoirs on the Magnetic Survey. Mr. Blanford, however, in examining some very well defined sections of the sandstone rocks in deep gullies cut by the supplying streams of the Usatari tank four miles to the east of Pondicherry, observed clear indications of cretaceous fossils underlying the sandstone, and being thus led to prosecute his researches into the subject perceived that the Usatari sandstone beds, instead of being under the cretaceous rocks, rest very unconformably upon them. Guided by the light thrown on the investigation of this fact, he instituted a careful comparison between the formations at Trivikeri and those at Usatari; and has come to the conclusion, on grounds which appear incontrovertible, that the Trivikeri sandstones are identical with those at Usatari, therefore newer than the cretaceous beds and unconformable to them.

The reading of this paper which was accompanied by a sketch map and section of the locality, excited much interest. It appears in this number of the Society's Journal.

Read the following letter from the Secretary to the Club together with Extracts from the Proceedings of the Sub-Committee thereof.

14*th April.*

The Secretary to the Club presents his compliments to the Secretary of the Literary Society and forwards herewith an Extract from the Proceedings of the Sub-Committee which he requests may be submitted to the Members of the Society at their next meeting.

By order.

(Signed) G. TALBOT,
Offg. Secretary.

Extract from the Proceedings of the Sub-Committee dated 12*th April* 1858.

Proposed by Mr. Burgass and seconded by Captain Hope, that application be made to the Literary Society that the Madras Club be allowed to subscribe, paying a fourfold subscription, thereby receiving a proportionate number of books.

The Committee engaging the books shall be faithfully returned at the prescribed period, and further that they shall not be removed from the Library.

Magazines and Serials will not be required. (Carried).

Resolved, that Mr. Burgass in communication with the Secretary to the Literary Society and the Secretary to the Club do arrange the conditions on which it is proposed that the books are to be supplied to the Club.

Dr. Montgomery laid the drawing of a Mango stone before the Committee in which the process of germination had commenced, and proceeded to some extent before it fell from the tree. (This will appear in the next No. of the Journal.)

The Committee acknowledge with thanks the receipt of the following books, &c.

From the Chief Secretary.

Indian Journal of Arts, Science, &c.

Deaths at Madras during 1855.

Papers relative to the colonization of the Himalaya Mountains.
Meteorological observations at Dodabetta.

Walter Elliot, *Chairman.* W. J. Wilson, *Secretary.*

At a Meeting of the Managing Committee of the MADRAS LITERARY SOCIETY, *and Auxiliary of the Royal Asiatic Society held at the Club House, on Thursday the* 8*th July* 1858, *at half past-* 6 *o'clock,* P. M.

PRESENT.

The Hon'ble Walter Elliot, Esq., *Chairman.*

The Hon'ble W. A. Morehead, Esq.
R. Burgass, Esq.
M. Norman, Esq.
Captain G. Winscom,
Major W. J. Wilson, *Secretary.*

The Secretary laid before the Meeting the usual monthly statement, prepared up to the 8th Instant.

Resolved, that the statement is satisfactory and be passed.

Resolved, that W. Hudleston, Esq., be appointed a member of the Managing Committee, and Secretary in lieu of Major W. J. Wilson, who has resigned the Secretaryship.

Resolved, that G. F. Fullerton, Esq. be appointed an acting member of the Managing Committee during the absence of W. H. Bayley, Esq.

A curiously shaped ancient spear head was exhibited by Mr. Elliot to the Meeting which had been found at a village not far from the Red Hills. It is of copper with the figure of a Lotus on one side, and probably belongs to the time of the Curumbars, the ancient inhabitants of the Carnatic who had their principal seat at Pural in the same neighbourhood.

Mr. Elliot also exhibited some specimens of Plumbago received from Mr. Storey at Palamcottah, who described them as having been found by Captain Boswell, of the 52nd Regiment, in the Hills at Paparassam where it occurs in considerable quantities.

It was resolved to communicate the specimens to Mr. Wall.

Walter Elliot, *Chairman.* W. J. Wilson, *Secretary.*

At a Meeting of the Managing Committee of the MADRAS LITERARY SOCIETY, *and Auxiliary of the Royal Asiatic Society held at the Club House, on Thursday the* 12*th August* 1858, *at half-past* 6 *o'clock* P. M.

PRESENT.

The Hon'ble Walter Elliot, Esq., *Chairman.*

E. Maltby, Esq.
M. Norman, Esq.
Colonel F. C. Cotton.
Captain G. Winscom,
R. Burgass, Esq.
G. F. Fullerton, Esq.

The usual monthly statement of the Society's Funds was read and passed.

A copy of the new Catalogue was laid on the table. The manner in which it was got up was approved, and the execution was considered creditable to all concerned.

Resolved, that two short notices be printed, one requesting that all applications for Books may describe the works in the exact terms of the new Catalogue, or that the page may be specified, and the other requesting that gentlemen will have the goodness to look over their books and return all such as belong to the Society which may have been in their possession upwards of 2 months.

Walter Elliot,
Chairman.

H. Hudleston,
Secretary.

At a Meeting of the Managing Committee of the MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, held at the Club House on Thursday the* 9*th September* 1858, *at half-past* 5 *o'clock*, P. M.

PRESENT.

The Hon'ble Walter Elliot, Esq., *Chairman.*

E. Maltby, Esq.
G. F. Fullerton, Esq.
H. B. Montgomery, Esq., M. D.
W. Hudleston, Esq., *Secy.*

The Secretary laid before the Meeting the usual monthly statement of the Society's Funds, prepared up to 9th instant.

Resolved, that the statement is satisfactory and be passed.

Resolved, that measures be taken by the Secretary regarding arrears of subscription to the Journal.

Resolved that a present of one hundred Rupees be made to Mr. Rozario, the Sub Librarian, as a remuneration for the trouble taken by him, at his leisure hours in the compilation of the new Catalogue.

Read a paper from Mr. Walhouse, submitted by the Honorable Walter Elliot, Esq., entitled "Notes Antiquarian and Mythical," which was transferred to the Sub-Committee on papers.

The Committee acknowledge with thanks the following books received.

From the Chief Secretary.

Indian Official Thesaurus—Introductory to Annals of Indian Administration.

Annals of Indian Administration, parts 3, 4, 5, 6 and 7.

Madras Exhibition of 1859—Of the Raw Products of Southern India.

Madras Exhibition of 1857—Report from the Local Committees.

Walter Elliot, *Chairman.* W. Hudleston, *Secretary.*

AGRI-HORTICULTURAL SOCIETY.

The usual Monthly Meeting of the Committee was held in the Society's Gardens, on Wednesday, 3rd *March* 1858, *at half-past* 6 A. M.

PRESENT:

The Hon'ble W. Elliot, Esq., *President.*
S. D. Birch, Esq.
H. F. C. Cleghorn, Esq., M. D.
J. T. Maclagan, Esq., *Secretary.*

The Minutes of last Meeting having been confirmed, the Secretary reported that a Native named Murrayen to whom the first prize for vegetables exhibited by Market Gardeners, and a prize for grapes were awarded, now appears to have no garden, but to be merely a retailer of vegetables; and it was resolved that in future years, all such intending competitors must intimate their intention to the Superintendent at least three days before the show, that the Committee may be satisfied for their being Market

Gardeners, and of the vegetables exhibited having been actually grown in their own gardens.

Read letter from R. B. Bell, Esq., suggesting that the Society should prepare a Digest of the various Reports upon Produce Cultivation in their possession, and that they should take measures to test the system of growing Cotton under the influence of irrigation.

Resolved, that the Secretary be instructed to thank Mr. Bell for his suggestion, and to state that the Records of the Society do not at present contain sufficient information to enable them to prepare a useful Manual, but that any important facts brought to their knowledge, will be from time to time communicated to the Public through the medium of the Scientific Journals. The subject of growing Cotton under irrigation has recently been referred by Government to various Societies and individuals, and the Committee will endeavour to procure a copy of all the information thus acquired.

The list of flowers and vegetable seeds for the present year, were carefully revised, and many novelties introduced including tubers of *Dioscoria Batatas* amongst vegetables, and a large number of Tropical Flowers from California Mexico.

The Meeting then adjourned.

J. T. Maclagan, *Secy.* Walter Elliot, *President.*

In the months of April and May no meetings were held.

The usual Monthly Meeting of the Committee was held in the Society's Gardens, on Wednesday, June 9th, 1858, *at half-past* 6 A. M.

Present.

The Honorable Walter Elliot, Esq., *President.*

C. Dale, Esq.

H. B. Montgomery, Esq., M. D., *Secretary.*

It was intimated by the President that Dr. Montgomery was on the 5th ultimo elected Secretary to the Society, vice J. T. Maclagan, Esq. who resigned that appointment.

Received Extract Minutes Consultation No. 556 approving this appointment.

The Secretary submits 10 copies of Dr. Cleghorn's Memorandum upon the Pauchontee, or Indian Gutta Percha Tree.

Ordered, that any member of the Committee desiring a copy be furnished with one. Two copies to be placed for record in the office of the Society. Also Drs. Hooker's and Thompson's Flora Indica. Also the reports of the Commissioners of Patents for 1855 (Section Agriculture), all the foregoing have been received from Goverment.

Resolved, that consequent on the return to Europe of R. O. Campbell, Esq., and the retirement from the Society of H. Forbes, Esq. C. S., and Surgeon James Sanderson, the following Gentlemen be elected members of the General Committee.

J. Vans Agnew, Esq.
Colonel Colbeck.
Andrew J. Scott, Esq., M. D.

Read letter from Messrs. Pharoah and Co. tendering for sale a sample of Indian Rubber tubing.

Resolved, that Messrs. Pharoah and Co. be informed that the Society does not require the tubing not having any Engine to which to attach it, and considering that it would not be found generally useful in the Garden.

The monthly accounts having been examined, and as it appears to the Committee that it is not now required to have more than 2 pairs of bullocks, it was unanimously resolved, that one pair of bullocks be sent to the next Periodical sale of Messrs. Waller and Co. to be disposed of outright.

The Secretary submits to the Committee the Ground plan of the new plot of ground adjoining the Cathedral, and directs attention to the condition of the wells in that ground.

There are at present three wells in the space marked on the plan as Nos. 1, 2 and 3 respectively, the first two of these are brackish and in indifferent repair.

The Committee decide that a trial well should be sunk in the two positions now indicated on the plan by the * * Should good water be obtained in either of those places, tenders are to be invited for the sinking of one well 12 feet in diameter and 30 feet deep, and that subsequently the wells No. 1 and 2 be filled in and the ground levelled over them.

Resolved, that the future meetings of the General Committee be held on the 1st Wednesday of each month, and that the members be requested to attend with as great regularity as their other engagements will allow.

The Secretary is requested to draw up a memorandum relative to the best means of labelling the more conspicuous plants in the Gardens, as suggested in his verbal communication to the Committee this day.

The President brings to the notice of the Committee a private letter from Major General Johnson, Commanding Tonghoo, intimating the arrival of two "Ward's cases" and a packet of seeds, which are much prized.

A moiety of the latter has been presented to the Revd. Dr. Mason, a Missionary and distinguished Naturalist in the Tenasserim Provinces.

Resolved, that the Secretary be instructed to open correspondence with the Revd. Dr. Mason with a view to an interchange of seeds with that gentleman, which are to be sent occasionally, when any are available for that purpose.

That on the present occasion the seeds named in the letter to address be forwarded

The meeting then adjourned.

Walter Elliot, *President.* Howard B. Montgomery, M. D., *Secy.*

The usual Monthly Meeting was held on July 21*st at half-past* 6 *o'clock* A. M.

PRESENT.

J. V. Agnew, Esq.	Lieut. Col. Colbeck.
Lieut. Col. McCally.	H. B. Montgomery, Esq., *Secy.*

There not being a quorum for the despatch of business, and the meeting was occupied for some time in the perusal and consideration of certain letters and papers relative to the proposal of the Manchester Cotton Association to send a quantity of New Orleans Cotton seed to India for experimental growth. The papers relative to this subject will appear at length in the next number of

this Journal. It was determined that unless in case of urgent business, no meetings of the Committee were to take place during the months of August and September.

PROCEEDINGS OF THE PHOTOGRAPHIC SOCIETY.

A Meeting of the PHOTOGRAPHIC SOCIETY *was held at the School of Arts, on Thursday, 4th March,* 1858.

PRESENT.

Hon'ble Walter Elliot, Esq., in the chair.

Messrs. Mitchell,	Messrs. Underwood,
,, Scott,	,, Neill,
,, Hunter,	,, Lafond, and
,, Cleghorn,	,, Duff.

The following gentlemen were elected members, Messrs. Cole, Paton and Nichols.

The Secretary laid on the table the collection of pictures printed by Mr. Sutton for distribution amongst the subscribers of 1856-57. The subjects are Pagodas on the Sevagunga Hill, view of the Parthasaratha Pagoda and Tank at Triplicane, and Goprum of the Ulsoor Pagoda from negatives, by Lieut. Mitchell. Old Banian and Date trees on the bund of the Hullahede tank, and ship "Duke of Wellington" in the Plymouth Dock from negatives by Captain Tripe, and a group of palmyra trees by Mr. Crake. The number of prints for distribution is 600, which will admit of nearly 6 being given to each subscriber.

Resolved, that the thanks of the Society be given to Messrs. Mitchell, Tripe and Crake for kindly placing their negatives at the disposal of the Society. It is to be regretted that the prints do not come up to the expectations that were entertained from the reputation of the Printer to whom they were entrusted.

Resolved, that the prints be distributed as soon as possible. Subscribers in Madras being requested to send to the School of Arts for their copies, and up-country Subscribers to make arrangements with their Agents for having them packed and despatched to their address.

Mr. Underwood mentioned to the meeting that he has for a considerable period been endeavouring to make an iodizing mixture for collodion, suited to the climate of Madras, and that he had reason to believe he had succeeded both with positive and negative collodion. Collodion iodized with it whether Horn's, Thomas's, Bertch, or made by himself, seemed to answer equally well. For positives the collodion should be dark, for negatives lemon color. The first is obtained either by keeping iodized collodion some time or what appears preferable mixing old collodion with collodion freshly iodized half and half, or one-third according to the age of the old collodion—the guide is not to mix enough of old collodion to make the film of the collodion tender. The color of freshly mixed iodized negative collodion should be removed either by silver or zinc. Mr. Underwood states, that the unsatisfactory results of collodion received from Europe is consequent upon the difference of the light in India. In England the shadows are light and the sun shining on an object illumines it, but in this country, the shadows are black and form a hard dark outline, while at the same time the object illumined by the sun has a dazzling brightness, consequently those parts are over exposed before parts in shadow are depicted on the collodion plate. A sacrifice must therefore be made, and the result is an unsatisfactory picture. Mr. Underwood exhibited three portraits by Mr. Nicholas which were taken with the collodion iodized with the mixture above mentioned. One of the Lord Bishop, one of Mr. Cherry, and one of Captain Nicholas. They were pronounced to be excellent portraits and very satisfactory Photographs ; the one of the Bishop appeared to exhibit the half tones in the most satisfactory manner, and the members present were of opinion that the whites were excellent in all while the blacks were clear, that there was a degree of brilliancy in the pictures, and that the half tones were well preserved.

A small paper positive printed from a collodion negative of Christ's Church taken by Mr. Nicholas was satisfactory, as in it the lights were excellent, while the parts of the building in shadow were well pourtrayed. Mr. Underwood observed it was satisfactory to learn that the end desired was considered to have been attained in the pictures laid before the meeting, and stated that

further trials would be made on a larger scale with collodion negatives, and the result notified to the Society, he mentioned that above 200 positive portraits had been taken by Mr. Nicholas with collodion iodized with the mixture above referred to, and the result was so satisfactory that he used no other.

Dr. Neil presented to the Society a number of Photographs of very great merit by several European Photographers. Amongst them were several prints from collodion negatives by F. Maxwell Lyte, remarkable for their clearness and accuracy of focusing as well as for their delicacy of ærial effect and clearness of printing. The valley of Parguerls represents a village picturesquely situated at the gorge of a hill with a very delicately graduated distance to the left, and a bold mass of broken rocky crags on the right. The field in the foreground is a little flat, and the gable end of the cottage too brilliant a spot of white to please the eye of a painter. The bridge of Orthee is a picturesque subject with a pleasing arrangement of light and shade, and a good foreground of broken rocks overhanging a placid shallow stream. The valley of Argeles is a representation of flat meadow land traversed obliquely by low hedges and terminated in the distance by fine hills brightly illumined by a mid-Sunday. A bridge of one arch overhung with ivy and spanning a broad deep river is an exquisite piece of Photography, the windings of the river with the distant hills, part of a house and garden, with a waterfall seen below the arch, and delicately reflected in the deep pool, make a most pleasing picture, the toning, manipulation and focusing of which are all excellent.

The Chateau Dr. Arras is a picturesque subject representing a ruined mansion on the brow of a woody hill with a range of snow clad mountains in the distance, and bold peaks in shadow rising in the mid distance, the effect of a cloudy day with a watery sky is well rendered, but the toning of the picture is a little inky. Some calotypes by H. Taylor are picturesque. The best is a cottage at Farucombe. A Talbotype of Caswell Bay Glamorgonshire gives an excellent idea of the Geological characters of the rocks in the vicinity. This picture however has not been sufficiently freed from Hyposulphite. An interesting picture, by R. Fenton of the Council of War held on the morning of the taking of the Mamelon re-

presents Lord Raglan, Omer Pacha and General Pellisier seated on Camp Chairs, at a small table, outside of a door way.

Two large views in the gardens at Hutton in Suffolk are beautiful as Photographs, picturesque as landscape studies, and valuable on account of their clear focusing and botanical accuracy. These are about the best Photographs of Trees hitherto seen in Madras.

Resolved, that the best thanks of the Society be given to Dr. Neill, for his valuable donation.

Lieut. Mitchell, exhibited a number of large negatives on paper, views lately taken of the monolithic temples, carved rocks, and cave temples at Mahavellpooram, or the 7 pagodas, these were exceedingly clearly brought out and delicate in the half tints. It was thought that they would yield fine impressions. The Secretary intimated that it would soon be necessary to make arrangements for printing the Photographs for distribution amongst the subscribers of the second year. Mr. Crake had kindly offered some of his negatives to be printed from, and other Members were invited to do the same.

Mr. Elliot suggested that Portraits of some well known members of Society might prove more acceptable to many members than landscapes, and it was resolved that the Council should take steps to procure some negatives if possible.

The Secretary read a communication from Mr. Lafond on the subject of an explosion from gun cotton, which occurred in his practice. Mr. Lafond had made some gun cotton, which was insoluble, following the recommendation of Mr. Clarke, he placed it in a mortar with the intention of soaking it for a short time in sulphuric acid. But the instant the acid was poured upon the gun cotton a violent explosion ensued from which he received a severe contusion on the forehead, and which might have been attended with more serious consequences.

The ordinary Monthly Meeting of the PHOTOGRAPHIC SOCIETY *took place at the School of Arts, on Thursday the 1st April.*

The Hon'ble Mr. Elliot, in the Chair.

The attendance was not so good as usual, owing to some misapprehension as to the day of meeting. Messrs. Duff and G. W. Cole, were proposed and elected members of the Society. The Secretary placed before the meeting positive prints from two negative Collodion portraits of Lord Harris taken by Mr. Nicholas with the assistance of some members of the Council, and intended for distribution along with the prints to which members become entitled who have paid up their 2nd years' subscription. They were pronounced to be faithful likenesses of his Lordship, and will no doubt, be much appreciated. It is hoped, that following out Mr. Elliot's suggestion, portraits of other distinguished members of Madras Society may be secured by the Council for distribution. Those members who have not paid the second years' subscription amounting to about 40, should lose no time in doing so; otherwise they will not be entitled to the above mentioned prints, and must of course cease to be considered members of the Society. Subscriptions are payable either to the Honorary Secretary or to Messrs. Parry and Co.

The Secretary announced that arrangements have been made with Dr. Neill, who has kindly placed any of his negatives at the disposal of the Society, to have two of his lists printed for distribution either in London or Paris, and it is hoped, he may succeed in having them executed in better style than those now being distributed. Dr. Neill has also kindly undertaken to endeavour to procure for the Society a negative of the late General Neill. A letter was read from Captain A. N. Scott of the Artillery, offering a couple of negatives to be printed for distribution, and it was unanimously agreed to accept his kind offer. The subjects are the caves of Ellora and the Tombs of Golconda.

A Committee consisting of Messrs. Underwood, Mitchell and Scott, was appointed to make arrangements for the approaching Exhibition which is to take place at the School of Arts in the beginning of nexth month, and the Council takes this opportunity of

reminding up country members of it, and of requesting them to send their contributions with as little delay as possible. Any members wishing to contribute, should forward their portions so as to reach the Honorary Secretary before the end of the present month at latest. There must now be a larger number of Photographists scattered over the country, and any contributions whether from members or others unconnected with the Society, will be thankfully received

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The Annual Meeting of the Photographic Society, *took place on Thursday, the* 6*th May, at the School of Arts.*

The Right Hon'ble Lord Harris in the Chair.

Present.

The Hon'ble W. Elliot, Esq.	Dr. Duff.
Captain Tripe,	Captain Barwise.
W. E. Underwood, Esq.	Colonel Browne.
Lieutenant Mitchell.	Messrs. Paton, Cole and Scott.

The Secretary laid a statement of the Funds before the Meeting and read the following

Report.

At the conclusion of another year of the Photographic Society's existence, the Council beg to submit a statement of the Funds as they at present stand, from which it will be seen that there is a balance in favour of the Society of Rs. 85 exclusive of a Government Promissory Note for Rs. 1000. Notwithstanding, they regret to observe, that no fewer than 50 out of 120 members have failed to pay their Annual Subscription—*some of these, however, have left the country.*

The monthly meetings have not during the past year been so fully attended as at first, nor have so many original communications been made as could have been desired. The cause of this may in a great measure be attributed to the disturbed state of the country during that period, which has not only distracted attention from such pursuits, but has also actually prevented several of our working members from devoting that time to the art which they

would otherwise have had at their disposal. Some have been, and are still, employed in active service in the North, while even of those resident in Madras, several have been so much occupied by the duties which have devolved upon them in consequence of this state of matters, as to have had very little time at their disposal for any thing else. And if this applies to Madras, it does so in a much greater degree to the other Presidencies, from neither of which have we received any direct contributions to our Annual Exhibition; a large and varied collection however published in the Bombay Amateurs' Journal is to be found in the Exhibition.

An endeavour was made last year to induce the Societies of the sister Presidencies so to fix the time of their respective Exhibitions, as to enable the three Societies to interchange contributions and thus render the Exhibitions more interesting. It is to be regretted that the Bombay Society have never replied to the Secretary's letter. The Bengal Society did so, and promised to consider the subject when arranging about their own Exhibition for this year. They appear to have overlooked the matter, however, for although a requisition has just been received from them soliciting contributions for their Exhibition that is announced to take place next month, they make no allusion to the proposal which was made to them, nor have they sent a single picture for our Exhibition.

In our own Presidency, however, there is every reason to believe that Photographers abound all over the country, and so great is the demand for Photographic chemicals, that Messrs. Flynn and Co. state that they have great difficulty in supplying it. This circumstance alone proves what has been above stated, and considering the many objects of interest to the Photographer in this Presidency, not only as regards Architectural remains and scenery, but also as illustrations of Ethnological questions, considering the great variety of races of the human family, the diversity of their costume and habits, the implements used in their manifold occupations, nearly all so different from what are used in Europe, it must be admitted that circumstances are most favorable to the production of a highly valuable and interesting class of Photographs characteristic of the country and its inhabitants, and it would un-

doubtedly be a matter for much regret were the opportunity lost of taking full advantage of these circumstances.

The existence of a Society such as this for the encouragement of the Photographic art in Madras, is the chief means by which in time these objects may be attained, and it would be a great pity were it allowed to fall to the ground for want of support. The Council therefore take this opportunity of urging the claims of this Society, particularly upon working Photographers. Of the doings of those not resident in Madras scarcely anything is heard, they hope this state of things will not continue, but that every one who uses the Camera will not only become a member of this Society, if not already one, but contribute his mite to establish and maintain the character of Southern India for the encouragement and cultivation of the Art.

The arrangement for procuring prints for distribution to the members of 1856-57, the Council regret to observe, was not so successful as they anticipated: they hope that in future this object of the Society may be more satisfactorily attained. The six negatives placed at their disposal for printing were forwarded to Mr. Sutton who has a good reputation as a Photographic Artist, but the prints received from him in the present instance do not come up to the expectation formed by the Council. They are evidently executed by the development process, which, although it has the advantage of rapidity and economy, (and, it is said, permanence) does not appear to suit all subjects so much as the original method of printing and gives a certain appearance of coarseness which is harsh and unpleasant to the eye. The Council hope to obviate this in future, and will use their best endeavour to have the prints for the next distribution executed in a better style, and more worthy the acceptance of members.

In regard to a room for the meeting of the Society, and where the Library and collection of prints can be kept, a step has been made in the right direction, as a room at the School of Arts has recently been placed at the disposal of the Society by the Superintendent of that Institution; and although there are difficulties in the way of its being made over entirely to the Society with this view, there is every prospect of its being rendered more available

for the purpose than hitherto, and with a little outlay and arrangement, it might be made not only a comfortable place of meeting, but also an interesting resort and rendezvous for Photographers at the Presidency. The funds of the Society being insufficient to enable the Council to secure a room, permanent arrangements are out of the question. The School of Arts being of a kindred character, is certainly the most legitimate institution for the Society to become associated with, and the advantage of their being so, may probably be found reciprocal.

As it will be necessary to determine immediately the number of prints required for distribution to the members for 1857-58, the Council request that those members who have not forwarded their subscriptions for the current year, will be good enough to do so by the 1st of June.

The following Gentlemen were then elected Members of the Society.—The Hon'ble W. A. Morehead, Esq., C. Roberts, Esq., Captain Barwise, Capt. Logan, Dr. Barclay, and Capt. S. Batten. —Captain J. D. Scott and Dr. Duff were elected Members of the Council in room of Mr. Cochrane and Dr. Hunter who have left Madras, the remainder of the Council were re-elected for the ensuing year.

The Photographs intended for Exhibition were displayed, and form a large and varied collection, including both Indian and European subjects. Many of the latter are of very large size and exquisite specimens of the art. These have been almost entirely contributed by J. G. Garrett, Esq., to whom the Society is much indebted for affording them an opportunity of inspecting the works of the best Photographers in Europe, and of seeing what can now be attained by skill and improved means. The views in Switzerland by Bisson Freres, and some groups of Flowers by Beam, attracted special attention. Mr. Garrett also contributed a large collection of Indian Subjects published in the Bombay Amateurs' Journal, and Mr. Underwood a number of admirable stereoscopic views and groups by the best Artists. Among the other contributors of Indian Subjects, are Lieut. Mitchell, Capt. Barwise, Capt. A. N. Scott, Mr. Nicholas, Capt. Buchanan, Mr. Underwood and Dr. Scott.

It was resolved that the Exhibition should be open to the public from Monday the 10th intant, from 7 A. M. till 6 P. M., and continue so during the present month.

The thanks of the Meeting were then voted to the Right Hon'ble the Chairman for his obliging conduct in the Chair.

THE exhibition of the Photographic Society for 1858, greatly disappointed its projectors. Among the very numerous Photographers scattered through the country, only two gentlemen in the Mofussil favored the Society with pictures for Exhibition. The Photographs exhibited, however, proved that the Artists of this Presidency are by no means less skilful manipulators than their brethren of the other Presidencies, and the excellence of their productions only increased the regret that the number of Exhibitors were so small. It is possible that fear of injury or difficulty of transmission may have deterred parties from exhibiting. If this be so, it is to be hoped, that before the exhibition of next year, Photographers in the interior, whether members of the Society or not, will communicate with the Secretary, when it is more than probable that all difficulties in the way of transmission will be removed.

The absence of the productions of Indian Photographers, was however (as far as such a deficiency could be) well made up by the very fine and numerous Photographs: English, French and Roman, placed at the disposal of the Society. Of these some stereoscopic pictures excited universal admiration and appeared to be with the majority, the principal attraction of the Exhibition.

Foremost among the pictures exhibited requiring notice are 25 views 15 x 11 by Lieut. J. Mitchell. These were intended to illustrate the Seven Pagodas so well known as objects of interest. They were admirably executed and are fully equal to any Photographs which have been produced in India, a list of these and the process by which they were taken is given in the Appendix to the Report.

Captain W. Barwise exhibited 42 prints from Collodion negatives, some taken in England, but the majority in Burmah. They

comprised portraits, groups and landscapes of every variety—the two former illustrative of the dress and customs of the Burmese. This gentleman appears to have used an old hypo-bath, the traces imparted by which, in our opinion did any thing but justice to the negatives, most of which must have been very clear, and should have yielded better proofs.

Dr. A. J. Scott exhibited 12 prints about 6 x 7 from waxed paper negatives, consisting of rare trees and views of places well known at the Presidency. These were taken with the anterior lens of a combination which appears scarcely to yield such perfect results as a proper landscape lens. Dr. Scott, we understand, will remedy this, before the next exhibition, and his pictures will then compete with the best.

Captain A. W. Scott exhibited a great frame which contained 24 positives on glass. Single portraits and groups, chiefly of Natives of the various castes found in the Deccan. They were excellently well executed and claimed for Captain S. an honorable place among Photographers. An old Moonshee was recognized by a person who had not seen him for 16 years. Mr. Nicholas exhibited some portraits of ladies and gentlemen, amongst them were two of Lord Harris, one a print, the other a glass positive. These pictures were admirably executed. The pose was good; the figures all in focus and the features, especially the eyes, quite distinct, and well delineated, and with one exception they were free from that common fault of Indian portraits, a rigidity of features which is doubtless caused by the excessive glare to which the situr is usually subjected when pictures are taken out of doors. The portrait of Captain Russell was a brilliant picture, and we think the glass positive of our worthy Governor, one of the best we ever saw. Altogether we should say these were such faithful likenesses as friends would desire to possess.

Some portraits of religious mendicants, were also exhibited by Mr. Nicholas. These were executed with the assistance of Mr. Underwood. These are curious in their way, and the selection of subjects were excellent. One party had a wire passed through his cheeks. Two others had large square iron frames riveted to their necks. The pictures are well executed, and copies are for sale at Mr. Nicholas' Studio.

Captain Buchanan exhibited a print 12 x 10 of Coonoor on the Neilgherries, from a Collodion negative. This is a faithful representation of the place, and a picture which no Amateur need be ashamed to exhibit any where. It is to be hoped that Captain Buchanan, will send a large portfolio of pictures for the next exhibition.

Mr. Garrat exhibited 47 beautiful views and portraits, some from the Bombay Photographic Album, others the work of English, French and Roman Artists, they are all good, and among them were some very superior Photographs. Of the portraits, that of the Metropolitan Bishop of the Syrian Church at Jerusalem printed at Bombay deserves especial notice. Among the European Photographs, were some fine views, admirably executed. The crucifixion by ——— is one of the finest Photographs ever exhibited, and has gained an European reputation. The Baptistry at Canterbury is also an excellent Photograph.

Some large Photographs of fruits and flowers received, as they well deserved marked attention, for they were nature herself, wanting only the colors. Captain Winscom exhibited 14 large views in Rome, including the Coloseum St. Peters, the Vatican, &c. These are by Macpherson, a well known Photographic Artist residing there. They are well executed, but some of the prints have faded considerably, a very common failing in prints taken some years ago. Of late this great defect in Photographic printing has been remedied to a great extent.

Mr. Underwood exhibited 6 views by Le Gray, 5 of these were views of sun and cloud and moving objects, chiefly marine, these are very ambitious attempts, and as specimens of what photography can do in delineating the passing cloud and moving waters they are really wonderful productions. The clouds however have a very thunder stormy appearance and make one instinctively button his coat and think of his umbrella. A Steamer *La Reine Hortense*, by the same artist is a better picture, though by no means so striking.

There is in it however an evident want of flatness of field, the margin of the picture being blurred considerably showing a large amount of spherical aberration in the lens.

Mr. Underwood also exhibited a large collection of stereographs on glass and paper which excited general admiration and attention. The table upon which they were laid was crowded, and many waited a considerable time to obtain a look at them.

The Exhibition was well attended particularly by Natives contrary to expectation. It is singular however, notwithstanding the opening of the Exhibition was announced in the principal local papers, numbers of the European and East Indian community never knew of it until it was closed, many came at the last moment only to feel regret that they had not had more time to examine, certainly the finest collection of Photographs ever seen in Madras.

We would suggest that before the next Exhibition, the Council of the Society communicate with Photographers in the interior and endeavour to induce them to take more interest in, and contribute more liberally to, the coming Exhibition than they have done to the one we have endeavoured to chronicle. When there is so much talent in the country, it is too bad to compel the Council to draw so largely upon foreign aid as they were obliged to do on this occasion.

The propriety of awarding some prizes to the Exhibitors of the best pictures, has, we understand, been under consideration by the Council, but there are some practical difficulties in the way of this. While however the bulk of Photographers in the Presidency consists of Gentlemen Amateurs, we scarcely think that such an inducement as this can be requisite, and we do hope on the part of the public that they will give the community of Madras an opportunity of admiring their works in the ensuing spring.

At the last Meeting of the Society, the Hon'ble Mr. Elliot exhibited some highly interesting views of Lucknow. The name of the Photographer was not stated, but they have evidence of being the work of the same professional Artist, although the printing has not been so carefully done as it might be.

The views are as follows :

No. 1.—Secunder Bagh in which is shown the breach through which the 93rd Highlanders stormed it, and also gate-way by which the 1st Madras Fusiliers entered.

No. 2.—Interior of the Secunder Bagh where 2,000 of the enemy were killed. In this picture quantities of bones and skulls

lie scattered about in the foreground, a vivid memento of the fearful slaughter which took place in this building.

No. 3.—Represents the Chutter Munzil and Farhat Bucks taken from the river. The former is now in use at the General Hospital.

No. 4.—The King's residence in the Kaiser Bagh, a fine specimen of mixed architecture where domes and minarets and fluted Grecian columns are to be seen in juxta position.

No. 5.—Wheeler's position at Cawnpore, the ruins of two large buildings vividly showing the impression made by shot and shell, groups of soldiers in the foreground.

No. 6.—The Bailey guard-gate to the embrasure where the Fusiliers entered the Residency on the 25th September 1857. To the right of the picture is seen a building which was occupied as the Hospital during the latter part of the siege.

No. 7.—View taken from the interior of the Residency, showing the old palace and a portion of the Kaiser Bagh.

No. 8.—View of the Residency from the burial ground, showing the rear of our defences. In the picture is also represented part of the Begum Kotree, where the ladies were during the siege, next to which are the ruins of a house used as a Mess House by the garrison. In the foreground is the spot where the Church stood, not a vestige of which now remains.

No. 9.—View of the Residency taken from the road between the Bailey guard-gate and Furhat Bux.

No. 10.—Ruin of the Residency, and the room in which Sir H. Lawrence was killed.

No. 11.—Represents a panoramic view of Lucknow, taken from the roof of the Kaiser or Bagh, gives the idea of a splendid city, palaces, mospue and minarets interspersed with beautiful gardens, in one of which a battery of Artillery is delineated. The impression given on viewing this picture is that few cities even in Europe could compete with Lucknow in grandeur of effect and architectural beauty.

At a late meeting of the Society, Captain Tripe brought to notice some very interesting facts connected with his experience of the dry collodion process, and he has kindly consented to draw up a short memo. on the subject for publication.

DAILY MEANS.

April 1858.

Date.	Barometer reduced to 32° Faht.	Thermometers. Means. Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1	29·891	83·3	76·9	93·2	77·1	E S E	....	Hazy
2	·874	82·4	75·8	96·5	75·9	E S E	...	Clody.
3				91·9	74·5	E S E	....	
4	·853	82·8	76·7	93·7	78·3	S E	....	Clody.
5	·859	83·5	77·7	93·5	77·4	E S E	....	Hazy
6	·843	84·6	77·3	96·7	78·4	E by S	....	do
7	·806	83·4	77·1	94·6	77·0	E S E	....	Clear.
8	·831	84·1	77·6	95·2	78·2	S E	....	do
9	·822	85·5	78·3	99·9	78·3	S S E	....	do
10				101·7	81·2	S by E	....	
11	·788	87·2	79·8	99·6	82·4	S	....	do
12	·816	86·4	80·6	96·2	82·9	S S E	....	Hazy
13	·816	85·5	79·9	94·9	81·7	S by E	....	Clear.
14	·840	85·2	79·6	94·5	81·4	S E	....	Hazy
15	·872	84·3	78·9	93·6	79·5	S E	....	Clear.
16	·894	84·3	78·7	93·7	78·9	S E	....	Hazy
17				94·6	79·1	E S E	...	
18	·875	85·0	79·0	94·9	78·7	E S E	...	do
19	·857	84·9	78·1	95·0	78·8	E S E	....	do
20	·877	84·9	77·6	96·0	78·9	E S E	....	do
21	·902	83·8	77·2	94·8	76·7	E S E	....	Clear.
22	·875	84·0	77·7	94·2	77·4	S E	....	do
23	·809	84·3	77·5	94·1	77·8	E S E	....	do
24				94·9	79·1	S E	....	
25	·772	85·6	79·1	95·6	80·9	S E	....	Hazy
26	·793	85·9	79·7	95·8	80·9	S E	....	do
27	·814	86·0	79·5	95·8	81·1	E by S	....	Clear.
28	·836	84·4	79·3	88·3	81·9	E N E	0·279	Ovcst.
29	·860	83·3	78·5	93·8	79·0	E	·361	do
30	·831	83·8	79·2	92·4	79·7	E by S	·192	Hazy
31								
Means	29·843	84·6	78·4	95·0	79·1		0·832 Sum	

May 1858.

Date.	Barometer reduced to 30° Faht.	Thermometers. Means. Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1				93·1	80·5	S E	....	
2	29·776	84·3	78·6	94·0	80·0	S E	0·014	Clody
3	·755	81·3	77·4	83·5	80·1	N S	·584	Ovcst.
4	·618	78·9	76·7	81·7	77·7	N	·595	do
5	·729	78·1	75·1	88·8	77·4	S by W	·018	do
6	·720	82·3	78·2	92·9	78·5	S S E	·004	Clody.
7	·693	84·8	79·3	95·2	79·8	S	...	Hazy
8				101·2	81·5	S S E	·779	
9	·733	83·8	78·6	93·7	79·0	?	....	Ovcst.
10	·740	84·4	79·2	98·7	79·2	S by W	....	Hazy
11	·698	85·6	79·1	96·2	80·3	?	....	do
12	·667	85·0	79·1	95·3	81·1	S by E	....	do
13	·663	84·6	78·2	95·4	79·7	S S E	....	Clody.
14	·683	85·1	79·0	94·4	80·3	S S E	....	Hazy
15				99·8	82·1	S S W	....	
16	·702	87·9	77·7	100·8	84·6	?	....	Clody.
17	·677	85·5	77·6	94·5	82·2	S W	·180	Ovcst.
18	·606	83·5	77·3	96·0	83·2	S W	·792	do
19	·619	85·3	76·6	97·6	79·2	?	....	do
20	·671	87·7	76·4	100·1	81·2	W by S	....	Clody.
21	·700	87·2	78·3	100·2	81·1	Anemometer under repair.	....	do
22				100·4	81·3		....	
23	·740	87·5	77·3	103·7	81·3		....	Hazy
24	·765	88·3	78·0	103·9	82·2		...	do
25	·775	88·2	77·7	104·0	83·1		....	do
26	·761	87·2	77·8	101·4	82·1		·068	do
27	·735	85·9	77·1	100·6	80·8		....	Clody.
28	·733	87·0	78·2	100·0	81·5		....	do
29				100·2	81·7		....	
30	·798	87·9	78·4	100·5	82·3		...	do
31	·787	89·2	77·8	103·4	82·3		....	Hazy
Means	29·713	85·2	77·9	97·1	80·9		3·034 Sum	

June 1858.

Date.	Barometer reduced to 32° Faht.	Thermometers. Means. Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1	29·753	88·0	77·1	100·1	81·8	Anemometer under repair	....	Clear.
2	·711	88·9	78·0	100·5	83·9		0·320	Hazy
3	·727	85·7	78·1	100·8	80·8		...	Clody.
4	·736	86·9	76·8	101·7	80·4		....	do
5				103·2	81·0		....	
6	·701	87·6	76·4	101·4	80·7		....	Hazy
7	·689	87·9	76·1	105·2	79·2		....	Clear.
8	·702	87·4	77·5	101·3	81·4		....	Hazy
9	·710	87·6	78·5	101·8	82·0		...	do
10	·706	89·0	78·5	102·9	82·2		....	Clear.
11	·694	89·2	79·2	102·7	82·7	S by W	....	do
12				106·5	84·5	S	....	
13	·690	89·9	79·4	105·5	83·4	S S W	....	Hazy
14	·724	89·7	79·6	104·5	83·6	S by W	....	do
15	·746	85·9	78·9	95·1	82·3	S S W	....	Ovcst.
16	·749	86·4	78·2	100·3	82·8	S S W	....	do
17	·739	85·2	78·2	98·6	80·7	S W	·937	do
18	·711	85·1	77·8	98·6	79·9	S W	·260	Clody.
19				97·8	81·5	S W	....	
20	·700	87·3	77·8	101·0	82·1	W S W	·010	do
21	·688	86·9	77·8	100·9	82·5	W S W	·106	do
22	·646	86·8	77·1	98·4	81·9	W	....	Ovcst.
23	·671	86·7	77·0	101·8	80·6	S	...	Clody.
24	·725	87·4	77·2	102·9	80·8	S by W	....	Hazy
25	·765	88·2	76·3	102·5	83·4	S W	... .	do
26				96·7	80·3	?	....	
27	·776	87·5	78·2	97·7	81·5	?	....	do
28	·764	88·8	79·1	104·8	83·4	S E	....	Clody.
29	·771	88·5	78·9	102·4	82·7	S by W	...	do
30	·769	88·2	78·8	99·5	82·5	W S W	....	Hazy
31								
Means	29·722	87·6	77·9	101·4	81·9		1·633 Sum	

July 1858.

Date.	Barometer	Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1	29·754	87·0	78·3	102·4	80·2	S	....	Hazy
2	·742	84·0	76·7	97·7	77·9	S S W	0·052	Ovcst.
3				93·5	76·7	S W	·045	
4	·732	84·9	77·9	97·7	76·6	S	·810	do
5	·684	83·9	77·4	97·0	78·5	W S W	·710	Clody.
6	·659	83·4	77·0	92·7	79·7	W S W	....	Ovcst.
7	·641	83·1	76·2	94·9	80·0	W	...	do
8	·656	86·3	77·3	98·9	80·9	W S W	....	Clody.
9	·696	85·7	77·4	100·9	81·1	W S W	...	do
10				98·2	78·8	W	·040	
11	·690	86·0	77·8	95·9	80·6	S W	....	Ovcst.
12	·680	85·6	77·8	95·1	81·4	W S W	...	do
13	·698	87·3	76·4	97·3	82·7	W S W	·176	do
14	·733	84·2	77·1	97·5	80·5	S W	·235	do
15	·764	82·6	76·2	96·8	79·2	S S W	·014	do
16	·775	83·7	76·5	91·0	80·2	?	....	do
17				95·2	81·4	?	....	
18	·762	86·2	76·7	98·5	82·6	W	....	do
19	·729	87·1	76·9	96·8	82·5	W	·027	do
20	·743	87·3	77·0	100·7	82·6	W S W	....	Clody.
21	·784	87·1	78·2	101·2	81·1	S S W	....	Hazy
22	·817	87·3	78·2	98·6	81·8	S	...	Clody.
23	·794	86·3	77·8	99·3	81·5	W S W	·070	Ovcst.
24				101·8	81·1	W S W	·006	
25	·734	88·2	76·9	102·2	82·6	W S W	·010	do
26	·755	87·3	77·9	101·3	80·6	S W	....	Hazy
27	·784	85·7	78·7	97·6	81·2	S	·212	Ovcst.
28	·782	83·4	77·6	95·3	78·5	S S W	·670	do
29	·766	83·9	78·3	96·6	80·1	S S W	....	do
30	·781	82·4	78·4	89·5	80·8	?	·060	do
31				89·5	78·7	S W	·047	
Means	29·736	85·4	77·4	97·1	80·4		3·083 Sum	

August 1858.

Date.	Barometer	Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1	29·797	81·6	76·7	94·5	75·5	S S W	0·620	Clody.
2	·754	83·9	77·0	95·9	78·3	S W	....	do
3	·755	82·3	77·6	93·5	76·7	W S W	·880	Ovcst.
4	·734	83·0	77·6	94·8	79·1	S W	....	do
5	·725	82·4	76·4	93·8	78·9	W S W	....	do
6	·716	84·3	76·6	93·9	80·2	S S W	·010	do
7				94·7	78·5	S W	·090	
8	·715	82·5	76·3	93·8	79·0	W by S	....	do
9	·677	85·6	76·4	97·9	80·2	W by S	....	do
10	·692	87·8	76·4	100·0	81·3	W S W	....	Clody.
11	·733	84·6	77·3	96·8	80·0	S W	.040	do
12	·726	85·9	78·4	98·9	81·0	W S W	....	Ovcst.
13	·782	84·0	78·3	96·6	79·5	W by S	....	Clody
14				95·8	79·8	W by S	....	
15	·810	85·6	78·1	97·7	80·6	W S W	....	Hazy
16	·801	84·7	78·6	95·7	79·7	W	·044	Clody.
17	·802	85·6	79·1	96·6	81·0	W S W	....	do
18	·805	85·3	78·1	96·6	80·8	W S W	....	do
19	·806	86·0	78·1	96·8	80·6	S W	....	do
20	·773	86·2	78·2	96·9	80·8	W by N	....	Hazy
21				96·1	82·5	S E	....	
22	·770	86·0	78·6	98·2	81·1	?	....	Clody
23	·814	85·3	77·8	96·8	78·8	S S W	....	Ovcst.
24	·861	86·0	77·4	99·9	80·6	S S W	....	Clody.
25	·788	85·9	78·2	96·1	80·0	?	....	do
26	·738	85·8	77·8	95·4	79·6	E S E	·390	do
27	·724	86·4	77·6	96·6	81·5	E S E	....	do
28				97·8	82·3	S E	....	
29	·737	87·2	78·3	100·2	81·8	E S E	....	Hazy
30	·701	85·2	77·5	99·5	78·9	S E	·035	Clody.
31	·741	86·2	76·8	97·5	80·1	W S W	....	do
Means	29·768	85·0	77·6	96·6	80·0		2·109 Sum	

September 1858.

Date.	Barometer	Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.
	Inches	°	°	°	°		Inches	
1	29·786	86·3	77·4	100·0	80·7	S S W	....	Hazy
2	·781	86·6	78·5	98·8	80·0	W S W	0·808	Clody.
3	·766	83·9	77·8	93·1	80·0	S W	...	do
4				95·6	80·4	S S W	....	
5	·764	83·2	78·1	96·7	77·3	S S W	1·479	do
6	·787	80·6	76·7	91·7	76·5	W S W	0·004	Ovcst.
7	·786	80·0	75·7	86·3	76·6	W N W	·198	do
8	·727	79·2	74·9	86·3	77·4	W	·102	do
9	·705	81·8	75·0	90·7	78·1	W by N	.. .	do
10	·741	83·9	75·3	96·0	79·1	W	....	do
11				95·5	80·2	S S W	....	
12	·745	84·4	76·1	91·9	80·6	S S W	·220	do
13	·759	83·6	76·3	92·2	80·2	S S W	·003	do
14	·766	84·2	75·4	95·0	80·0	?	....	do
15	·775	84·9	76·3	97·9	79·7	S S W	....	Clody.
16	·811	85·0	78·5	96·6	80·3	S S W	·008	Ovcst.
17	·836	83·6	77·8	94·7	78·8	S S W	·770	Clody.
18				95·8	78·8	?	·015	
19	·786	85·1	76·3	94·7	82·0	S W	....	Ovcst.
20	·778	84·6	75·0	95·9	78·4	S S W	....	do
21	·786	84·5	75·4	95·4	79·1	S S W	...	Hazy
22	·816	84·1	75·5	93·8	78·9	S W	....	do
23	·853	84·6	76·1	95·8	78·8	S W	...	do
24	·845	84·9	76·5	97·0	80·0	S S W	....	Clody.
25				96·0	79·5	S S W	....	
26	·835	84·3	77·5	95·8	79·5	W S W	....	do
27	857	84·7	77·9	96·6	79·2	S S W	....	Hazy
28	·882	84·5	78·2	93·6	79·4	S W	....	do
29	·882	84·6	77·7	95·1	79·3	S	....	do
30	·831	85·6	78·2	94·8	81·0	S S E	. ..	do
31								
Means	29·795	84·0	76·7	94·6	79·3		3·607 Sum	

? This mark signifies that no means can be taken owing to the variable state of the wind.

HOURLY MEANS.

Gottingen Mean Time.	Noon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Means
Madras Mean Time.	h. m. 4 41	h. m. 5 41	h. m. 6 41	h. m. 7 41	h. m. 8 41	h. m. 9 41	h. m. 10 41	h. m. 11 41	h. m. 12 41	h. m. 13 41	h. m. 14 41	h. m. 15 41	h. m. 16 41	h. m. 17 41	h. m. 18 41	h. m. 19 41	h. m. 20 41	h. m. 21 41	h. m. 22 41	h. m. 23 41	h. m. 0 41	h. m. 1 41	h. m. 2 41	h. m. 3 41	
Bar. at 32° Far. 1858	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.*	In.	In.*	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Apr.	29·773	29·787	29·810	29·833	29·858	29·872	29·876	29·867	29·850	29·836	29·827	29·825	29·834	29·846	29·866	29·890	29·905	29·902	29·890	29·868	29·837	29·809	29·787	29·772	29·843
May	·645	·663	·686	·708	·726	·741	·748	·737	·724	·709	700	·698	·705	·719	·740	·757	·767	768	·755	·732	705	·680	·658	·645	·713
June	·654	·668	·688	·709	·732	·750	·756	·749	·734	721	·714	·711	·718	·731	·752	·764	·774	·771	·757	·739	·716	·693	·667	·653	·722
Dry Ther. 1885	°	°	°	°	°	°	°	°	°	°	°	°	•	°	°	°	°	°	°	°	°	°	°	°	°
Apr.	88·1	85·7	84·0	83·3	82·9	82·6	82·1	81·4	80·8	80·2	79·8	79·2	78·6	78·2	80·1	83·4	86·3	88·9	90·4	91·2	91·1	91·0	90·5	89·6	84·6
May	88·8	86·9	84·5	83·7	82·9	82·7	82·3	81·8	81·4	80·9	80·4	80·2	79·8	79·7	81·6	84·2	86·4	88·6	90·2	92·4	92·1	92·3	91·9	90·6	85·2
June	90·7	88·4	85·9	84·8	84·1	83·6	83·4	83·0	82·6	82·3	82·1	81·8	81·4	81·2	83·5	86·9	90·1	92·3	94·4	96·1	96·8	97·1	95·6	93·5	87·4
Wet Ther. 1858																									
Apr.	79·3	78·9	78·5	78·4	78·3	78·1	78·0	77·9	77·5	77·3	77·2	76·9	76·5	76·1	77·1	78·3	78·6	79·1	79·6	79·7	79·8	79·6	79·6	79·6	78·4
May	79·3	78·8	78·3	78·2	77·9	77·9	77·9	77·6	77·5	77·1	76·8	76·7	76·4	75·9	76·5	76·9	77·2	78·2	78·1	78·8	79·2	79·1	79·4	79·6	77·9
June	79·3	79·2	78·9	78·7	78·6	78·4	78·3	78·0	77·7	77·4	77·2	76·8	76·4	75·5	76·0	76·9	77·3	77·6	77·9	78·3	78·7	79·0	79·4	79·3	77·9
Bar. at 32° Far. 1858																									
July	29·666	29·678	29·696	29·720	29·740	29·759	29·765	29·761	29·744	29·735	29.729	29·728	29·732	29·744	29·761	29·775	29·786	29·787	29·777	29·761	29·739	29·717	29·690	29·673	29·736
Aug.	·688	.703	·721	·744	·767	·784	·787	·780	·769	·758	·750	·749	·754	·766	·782	·801	·812	·814	·803	·784	·758	·730	·704	·691	·758
Sept.	·723	·739	·764	·790	·814	·830	·832	·823	·810	·797	·789	·783	·789	·800	·819	·841	·854	·851	·839	·817	·785	·755	·729	·720	·795
Dry. Ther. 1858	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
July	90·4	88·4	85·6	84·5	83·5	82·8	81·9	81·3	81·0	80·7	80·4	80·2	80·0	79·9	80·9	83·1	85·5	87·7	89·6	91·2	92·5	92·9	93·2	92·0	85·4
Aug.	89·6	86·9	84·4	83·6	83·1	82·6	82·3	81·9	81·3	80·7	80·2	79·8	79·2	79·0	80·1	82·8	85·4	87·6	89.5	91·2	92·2	92.9	92·3	91·4	85.0
Sept.	87·8	85·3	84·1	83·2	82·6	82·2	81·9	81·4	80·9	80·3	79·7	79·2	78·7	78.5	79·5	81·8	83·8	86·1	87·9	89·5	90·4	90·6	90·4	89·1	84·0
Wet Ther. 1858																									
July	78·9	78·9	78·4	78·3	78·3	77·7	77·3	77·1	76·9	76·6	76·4	76·2	75·9	75·4	75·4	76·2	76·8	77·3	77·7	77·9	78·1	78·4	78·8	78·8	77·4
Aug.	79·3	79·1	78·4	78·3	78·2	78·0	77·8	77·5	77·0	76·7	76·5	76·2	76·0	75.6	76·0	76·7	77·1	77·4	77·6	77·9	78·4	78·9	79·2	79·3	77·6
Sept.	77·9	77·5	77·4	77·2	77·1	77·0	76·9	76·7	76·4	76·3	76·1	75.9	75·7	75.1	75·0	75·3	75·8	76·2	76·6	77·1	77·6	77.6	77·8	77·8	76·7

* The numbers in these columns are not observed but interpolated for the sake of obtaining the daily means.

MADRAS OBSERVATORY: }